4.2 HAZARDS AND HAZARDOUS MATERIALS

This section discusses the potential safety and risk issues that may be associated with the proposed Project. Public safety and risk issues include those that could adversely affect public health. The potential discharge of hazardous materials into the environment, such as crude oil spills, is also quantified in this section; however, associated impacts are discussed in Sections 4.4, Hydrology, Water Resources, and Water Quality, and 4.5, Biological Resources. The information presented below outlines the environmental setting, regulatory setting, significance criteria, the potential for upset, the levels of public safety and risk associated with those potential upsets, and their significance. This section also presents discussions of impacts associated with alternatives to the proposed Project as well as projects identified for the cumulative analysis.

4.2.1 Environmental Setting

For the proposed Project, environmental setting or baseline conditions reflect the condition and operation of the existing facilities and present environment that could be affected by the proposed Project or the alternatives. Once the baseline risks are quantified, significance criteria are used to determine if there is an increased level of risk associated with the proposed Project or alternatives, and to determine if the proposed change in the system introduces a significant increase in potential impacts.

The Central Coast Area has a number of oil and gas fields located onshore and offshore. The Division of Oil and Gas indicates that there are 61 active fields in Districts 2 and 3, encompassing Ventura, Santa Barbara, San Luis Obispo, Monterey, Santa Cruz, and Santa Clara Counties. The California State Lands Commission (CSLC) indicates that there are 20 fields in State tidelands, with seven producing, 10 not producing, and three not developed (CSLC 2004). In addition, there are a total of 19 Federal Outer Continental Shelf (OCS) platforms.

Although oil and gas pipelines and processing facilities in the region are engineered to the safety standards current at the time of construction and undergo rigorous safety studies and environmental reviews during Project approval and oversight, the nature of the materials handled by these pipelines and facilities still poses risks to people and the environment in the vicinity. Risks may include exposing the population to accidental spills of materials, which can subsequently lead to biological or hydrological damage, exposure to toxic materials, fires, and explosions.

Study Area and Scope

The study area and scope includes the facilities that are examined as a part of this study, the residential and sensitive receptors in the area, and the environmental issues that could affect the risks associated with the Project, including ocean waves and weather.

Study Scope

- The study area for this safety and risk analysis includes the existing facilities and pipelines associated with the proposed Project, the alternatives, and the areas in the immediate vicinity of the proposed Project that could be affected. The facilities where the current risk of upset is potentially changed due to the proposed Project or alternatives include:

- Line 96;

- The Ellwood Marine Terminal (EMT), including the onshore tanks and pumps and associated piping;

- The marine terminal loading line; and

- The barge Jovalan.

To a lesser extent, the internal functioning of the Ellwood Onshore Oil and Gas Facility (EOF) could also be affected by some of the alternatives. However, these impacts are not discussed unless there would be a change to the risks as defined by the Quantitative Risk Analysis (QRA) conducted in 2000 (SBCFD 2000).

Study Area Receptors

The study area includes those areas of Ellwood and the neighboring community that could be affected by a release of hazardous materials. This includes residential and commercial areas as well as environmental areas. Areas remote to Ellwood, such as the coastline and traffic routes to and from Los Angeles and San Francisco, are also areas that could be affected by the proposed Project or the alternatives. Descriptions of the environments in these areas are addressed in Section 4.4, Hydrology, Water Resources, and Water Quality, and Section 4.5, Biological Resources.

An upset condition that results in a subsequent release of hazardous materials at the facilities listed above could have an adverse impact on public safety and environmental resources in the study area. Populations in the area include people living or working in the Devereux Facility, West Campus Housing, Married Student Housing, Francisco Torres dormitories, and residential areas in Ellwood between Marymount Way, Ellwood Beach Drive, Hollister Avenue, and Highway 101. Other sensitive receptors in the area include persons on boats, those surfing or swimming near Coal Oil Point, and other people in the vicinity of the barge Jovalan, loading line, and marine terminal. Environmental impacts could be realized along creek corridors and coastal areas, including the Channel Islands.

Population densities vary widely. Beach populations are sporadic and weather dependent. Based on observations of the beach areas, beach populations were estimated to be a daily average of 5 persons per 1,000 square feet (304 square meters [m^2]). Populations at the community of Isla Vista are based on U.S. Census Bureau Block Number 2902 for the year 2000 (U.S. Census 2005), which indicates a population as high as 63,000 persons per square mile (24,600 persons per square kilometer [$/km^2$]). Ellwood densities for Census Block Number 2904 range as high as 28,000 persons per square mile (10,700 persons/km^2). Distances from populations to the facilities are tabulated and shown in Table 4.2-1, below.

The National Oceanic and Atmospheric Administration (NOAA) Office of Coast Survey's Automated Wreck and Obstruction Information System (AWOIS) contains information on approximately 10,000 submerged wrecks and obstructions in the coastal waters of the United States. Data for the area immediately around the EMT show a number of obstructions related to old piers located between 0.4 and 2.4 miles (0.6 and 3.9 km) to the north of the loading line at or near the beach areas, and a single obstruction located approximately 0.6 miles (1 km) to the south of the loading line.

Recent seafloor surveys, provided in Venoco’s application and conducted by Fugro West in January, 2002, indicate that three exposed pipelines, originating from ARCO’s PRC 308 subsea completion wells offshore of Coal Oil Point, traverse the seafloor east of the Venoco PRC lease 3904.1 (Venoco 2003). These are located approximately 600 feet (183 m) to the east of buoy Number 3. An unidentified target is also located 400 feet (123 m) to the west of buoy Number 5. An obstruction is also located immediately near the mid-point of the loading line (see Figure 4.2-1).

Table 4.2-1
Distances from the EMT to Residential and Sensitive Receptors

Population	Distance to Closest Facility Component (in feet)
Beach Area – from pump house	850
Beach Area – from tank dike area	1000
Golf Course closest area	1200
Marymount Drive residences	1960
Devereux Complex	2200
Ellwood Beach Drive residences	2350
Married Student Housing	2500
Country Gardens Residential Care	2950
West Campus Housing	3100
Coal Oil Point Residence	3100
Isla Vista Elementary School	3560
Francisco Torres Student Dorms	3600
Village Park Child Care Center	4250
Ellwood School	6100

Source: GIS Maps, Santa Barbara County Dept. of Social Services, U.S. Census Bureau 2005.

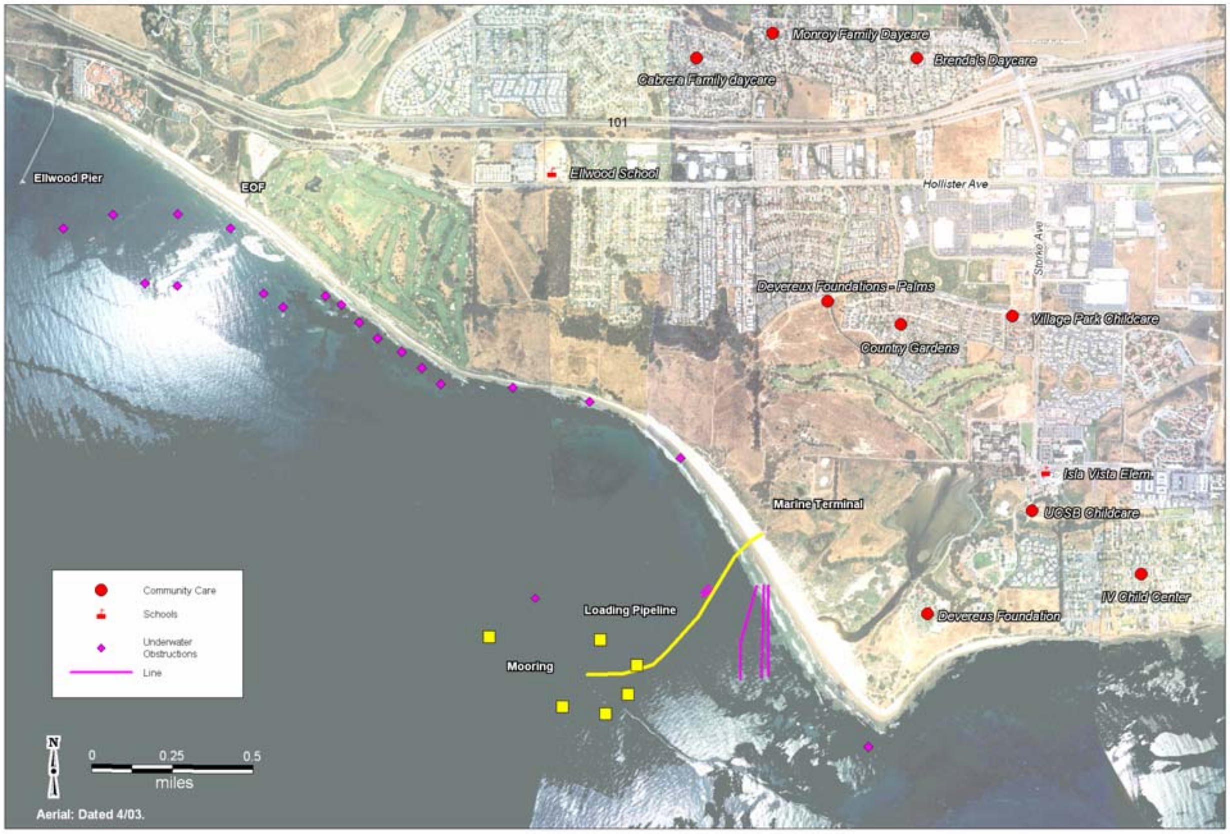
Characteristics of Crude Oil

A spill of crude oil from the pipeline or tanks could damage environmental resources and produce public safety concerns as a result of toxic vapors and fires that may arise if the oil or the oil vapors reach an ignition source and the oil burns.

Flammable vapors that may emanate from crude oil include propane, butane, and pentane. There may also be safety hazards resulting from toxic vapors, primarily benzene and hydrogen sulfide (H_2S). As it emerges from the wellhead, crude oil is a heterogeneous mixture of solids, liquids, and gases. This mixture includes sediments, water and water vapor, salts, and acid gases, including H_2S and carbon dioxide.

Sulfur occurs in many natural compounds and as H_2S in crude oil. Total sulfur ranges from approximately one to four percent by weight in crude oils, and H_2S concentrations can reach 100 parts per million (ppm) in “sour” crude oil. Other constituents of crude oil include nitrogen and oxygen compounds, and water- and metal-containing compounds, such as iron, vanadium, and nickel.

Figure 4.2-1
Sensitive Receptors in the Project Area



Most of the light ends, e.g., the propane, butanes, etc., and the H_2S are removed from the crude at the EOF before the oil reaches the EMT. Some H_2S does remain in the crude oil, however. In the vapor space of the EOF crude-oil tanks, H_2S concentrations can be as high as 9,000 ppm (SBCFD 2000), as were measured in the EOF crude-oil storage tank vapor spaces. The barge Jovalan monitors for H_2S concentrations in the vessel head space. The maximum value monitored for is 1,600 ppm. This would be the equilibrium concentration; the value above a pool of spilled crude oil would be much lower. H_2S in small concentrations produces nuisance odors; see Section 4.3, Air Quality, for a discussion of odor impacts.

Information regarding the physical properties of the Ellwood crude oil is shown in Section 2.0, Project Description (Table 2-1).

Environmental Factors

This section summarizes environmental conditions described in the U.S. Coast Guard (USCG) Pilot, Volume 7, 34th Edition, 2002, that could have an impact on vessel safety.

More detailed information on many of the areas can be found in the existing conditions descriptions of other sections; for example, detailed meteorological data can be found in Section 4.3, Air Quality.

The mild climate from San Diego to Point Arguello is controlled by the Pacific high-pressure system. Aided by the sea breeze, it brings winds from off the water, mainly south to north, which helps keep coastal temperatures up in winter and down in summer. Coldest average temperatures range from 55 to 59 degrees Fahrenheit (°F) (12.8° to 15.0°Celcius [°C]), while summertime readings are most often 70° to 79 °F (22° to 16°C). Occasionally a hot dry flow off the land in autumn will cause temperatures to soar into the 90° to 99 °F range (33° to 38°C), and a rare winter outbreak from the east can drop temperatures to below freezing (32 °F or <0°C). Winter is the rainy season, although not much rain falls along these coasts.

Strong winds and rough seas, while less frequent than farther north, can be a problem from the middle of fall through late spring. Strong pressure gradients, distant storms, and infrequent close storms account for most of the gales and seas of 12 feet (3.7 m) or more, particularly off Point Arguello and in the Santa Barbara Channel.

Strong local winds (commonly called Santa Ana winds) also generate gales along sections of this coast. Advection (or sea fog), formed by warm moist air flowing over cool water, frequently confronts mariners in these waters. It is a persistent and widespread problem, particularly in the summer and fall north of Santa Monica, and in fall and winter south of Santa Monica.

The pilot book lists characteristics for this stretch of coastline as shown in Table 4.2-2.

Ocean depths in the area of the mooring range from 45 to 65 feet (13.7 to 19.8 m).

Table 4.2-2
Ocean and Wind Conditions – Percent Frequency

Weather Elements	Annual Average	Monthly Maximum
Wind > 33 Knots	1.3	2.2
Wave Height > 9 ft	6.4	10.6
Visibility < 2 nautical miles	6.3	8.7
Precipitation	3	5.8
Temperature > 69°F	1.7	4.2
Mean Temperature (°F)	58.8	62.8
Temperature < 33 °F	0	0.1
Mean Relative Humidity (percent)	82	86
Overcast or Obscured	31.4	50.6
Mean Cloud Cover (8ths)	4.5	5.4
Prevailing Wind Direction	NW	0

Source: USCG 2002.

Historical Activities

Development of these natural resources has been ongoing for the last century. As a result, there are many different oil and gas facilities of different ages and functions scattered throughout the region.

The Comstock Homes EIR (City of Goleta 2004) provides a discussion of the past oil and gas developments on the Ellwood Mesa. Petroleum hydrocarbon and petrochemical contaminants are likely to be associated with past oil drilling activities on the Ellwood Mesa. Impacts could have resulted from historic oil wells, tanks, flow lines or sumps, and other oil field related equipment that were associated with oil development on the mesa. Sumps were typically excavated dirt ditches or depressions and were used from the 1920s through the 1940s. Sumps at wells were used to hold drilling fluid, cuttings, and oil generated during the initial drilling of the well. Records of exact locations of sumps were not maintained as a practice. In addition, the cleanup practice during this time frame was usually to cover over the sump with topsoil.

Abandonment of some of the onshore wells in the project region may have occurred as early as the 1930s. The California Division of Oil, Gas, and Geothermal Resources (DOGGR) has specific requirements for abandonment of oil wells. These oil wells may or may not have been abandoned in accordance with the standards of the time, which were not as strict as current standards.

Approximately 20 oil and gas wells that were developed over the last 75 years have been identified on the Ellwood Mesa. Most of the wells that produced are located in the western region of the mesa, termed the Santa Barbara Shores sub-area. An oil and gas plant was located in this region and was operated by Barnswell Oil Company until the 1950s. This area has a number of sumps and some subsurface contamination (City of Goleta 2004). Figure 4.2-2 below shows a photograph of the oil and gas development along the Ellwood Coast in 1938. The current onshore EMT facilities would be located slightly off the bottom of this photograph.

Figure 4.2-2
Ellwood Coast and Mesa in 1938

Source: CSLC no date.

The Comstock Homes EIR indicates that a fire possibly occurred on the mesa and could have been due to oil or methane gas migration and subsequent releases to the environment due to improperly abandoned oil wells or equipment. This speculation has not been substantiated, but the Comstock Homes EIR recommends additional onsite investigation.

Past Studies

A QRA was conducted for the Santa Barbara County Fire Department (SBCFD) by Arthur D. Little, Inc. in 2000 (SBCFD 2000). This study examined a number of hazardous material release scenarios from the EOF and quantified their frequencies and potential impacts on the surrounding populations, including the then-not-built Bacara resort and the proposed Sandpiper residential development, as well as the proposed modifications to the Sandpiper Golf Course. Mitigation measures (MM) were developed that reduced the risks associated with the facility to acceptable levels as per the Santa Barbara County Safety Element. Most of these mitigation measures have been implemented. The scope of the QRA study included the EOF and Platform Holly, but not Line 96 or the EMT.

The 2000 QRA concluded that the main risk to the population from the EOF is due to the separation and storage of liquefied petroleum gas and natural gas liquids. These gas liquids have the potential to produce large flame jets or boiling liquid expanding vapor explosions that, if released, can affect a large area.

A risk assessment of the onshore components of the EMT was prepared by PLG Engineers, Applied Scientists, and Management Consultants in 1996 to assess the potential risk of fire, explosion, and release of toxic gas from the EMT (Wallace, Roberts & Todd 1997). The PLG analysis concluded that, although no explosion hazards exist at the EMT, there would be an impact to nearby areas due to thermal radiation from a crude tank fire and toxic impacts due to H_2S released from spilled crude oil. H_2S levels were estimated to be 30 ppm (ERPG-2, Emergency Response Plan Guidelines, established by the American Industrial Hygiene Association) at 355 feet (108 m) from a crude oil spill.

A site assessment of the EMT that was conducted in 1995 indicated the presence of contaminated soil in varying concentrations under and around the storage tanks (City of Goleta 2004).

Recent Audits and Inspections

Information related to the historical EMT operations before Venoco's ownership is sketchy at best. An operational history is detailed in Section 2.0, Project Description. Table 4.2-3 provides a listing of major repair work and analysis conducted on the EMT,

Table 4.2-3
Santa Barbara County Energy Division Files Recent History

Year	Audit, Test, Procedure
1995	Hydrotest of loading line – passed. Ultrasonic testing on selected areas of onshore portion of loading line – no issues. CSLC inspection Replaced most onshore loading line supports.
1998	Overhauled mooring system, pressure tested hose – no issues. Heavy storms expose significant portion of loading line on beach. Subsequent studies were provided by Venoco in regard to the ability of the pipeline to support the span across the beach – estimated ok up to 40 to 68 ft. Ultrasonic testing on selected locations of 10-inch pipe around span area – ok.
1999	Ultrasonic testing conducted on selected portions of onshore loading line in relation to the spanning issue – no issues. Analysis by County on span issue estimated ok up to 30 ft. The barge Jovalan Air Pollution Control District (APCD) and CSLC safety audit and emissions testing – deficiencies related to air emissions and procedures/documentation. APCD abatement order Systems Safety and Reliability Review Committee (SSRRC) and CSLC facility audit
2000	Hydrotest – leak developed on 12/13 test at approx 750 ft. from the pump house was weld patched. Passed subsequent hydrotest on 12/21 Ultrasonic testing on selected portions – indicated anomaly 300 ft. south of EMT fence-line. Conventionally patched. Accuracy of ultrasonic testing (UT) in question.
2001	Ultrasonic testing of 23 ft. of the 10-inch line close to water line. Thickness good but some coating failure and exposure. Recommended recoating Ultrasonic testing of 12-inch line from pump house to beach – no anomalies and no evidence of excessive internal corrosion. Numerous areas with no external coating. Recommended prepping and coating. Some rusting and support issues for valves and flange components. Noted no lateral or vertical restraint support features. First Long Range Guided Ultrasonic Screening (GUL) inspection: approx. 100 ft. of 10-inch line at the beach – general wall loss of 15 percent (0.34 from 0.40 inch). Entire 12-inch line tested – isolated corrosion pits with up to 35 to 44 percent wall loss with minimum wall thickness of 0.210 inch. Analysis of loading pipeline stresses – ok Hydrotest of loading line – ok
2002	Line 96 hydrotest – ok GUL testing – similar to 2001 Cathodic protection survey of pipeline end manifold (PLEM) Overhauled mooring system, pressure tested hose – no issues.
2003	Hydrotest of loading line – passed
2004	Maintenance and Quality Assurance Program inspection – leak at EMT Tank 8264 oil inlet area GUL inspection – similar to previous
2005	Hydrotest of loading line – passed EMT Tank floating roof failure

particularly the loading line, in the past 10 years. This information was compiled from the files of the Santa Barbara County Energy Division.

Mooring system overhauls and cathodic protection surveys are conducted annually. Not all of them are shown in the above cited table. The mooring system annual maintenance includes the following issues (as detailed in the Applicant's application):

- Overhaul existing mooring cans;
- Inspect each mooring anchor leg chain and replace as necessary;
- Test and inspect loading hose sections, to 375 pounds per square inch (psi) (0.07 bar) and 20 inches (165 cm) vacuum;
- Perform cathodic protection survey of loading line end manifold; and
- Maintain pipeline marker and lifting buoy.

The Systems Safety and Reliability Review Committee (SSRRC) audit conducted in 1999 and 2000 identified a number of issues that have been addressed. In particular, upgrades to the fire protection systems were required and have been completed. Please see Section 4.8, Public Services, for a discussion of the requirements of the SSRRC audit.

Historical Releases

Information related to historical spill incidents in the United States have been compiled by a number of sources, including the USCG, NOAA, and California Department of Fish and Game (CDFG). Significant spills into the United States marine waters (U.S. waters) for the last 20 years are listed in Appendix C. Note that some of the significant spills are from barges, with the most notable barge releases listed below:

- The Apex Houston leaked an estimated 25,000 gallons (95 m^3) of crude oil between San Francisco and Los Angeles from an incorrectly installed loading hatch;
- The Nestucca spilled an estimated 23,100 gallons (87 m^3) of oil in Washington State from a collision with its tug due to an improperly maintained tow line;

- The North Cape spilled an estimated 828,000 gallons (3,134 m^3) due to its tug catching fire, drifting, and becoming grounded;
- The Bourchard 120 spilled 98,000 gallons (371 m^3) due to puncture of the barge bottom; and
- The NMS 111 spilled 80,000 gallons (303 m^3) due to overfilled tanks.

The USCG responds to vessel casualties in all navigable waters in and near the United States. The database of marine casualties, as maintained by the USCG, was queried for this study to determine the numbers of barge-related casualties and those that produced pollution events (USCG 2005c). Table 4.2-4 below, summarizes this analysis for all U.S. waters and for waters on the West Coast.

Many of the navigable waters, such as rivers, lakes, harbors, etc., are considered inner waterways. The fraction of pollution incidents that occur in the inner waterways is approximately 92 percent for all U.S. waters and approximately 67 percent for the U.S. West Coast. The lower number for the West Coast reflects the fact that there are many inner waterways, such as the Mississippi River, the Atlantic Intercoastal Waterway, the Great Lakes, etc., in the Gulf, the Midwest, and Atlantic areas, while there are fewer inner waterways on the West Coast.

Information on spills from the project components was obtained from the California State Office of Emergency Services Hazardous Materials Spill Reports database for the years 1993 through 2003 (CSOES 2005), from the Federal Emergency Response Notification System (ERNS) database for the years 1990 through 2003 (ERNS 2003), and from the Federal Department of Transportation Office of Pipeline Safety database since the 1960s (USDOT 2004a, 2004b). Searches were made of these databases and of the Santa Barbara *News Press* archives in order to identify any historical release incidents. Table 4.2-5 summarizes the releases identified from these databases. Note that, as confirmed by the USCG Marine Safety Santa Barbara detachment (USCG 2005a), over the past 10 years there have been no incidents associated with the barge Jovalan.

Table 4.2-4
USCG Barge Casualties: 1997 to 2001

	All US Waters		US West Coast Waters	
Primary Causality Type	**Number**	**Pollution Fraction**	**Number**	**Pollution Fraction**
Abandonment	8	0.00	0	-
Allision	1,014	0.04	30	0.07
Capsizing	17	0.12	0	-
Collision	528	0.09	7	0.43
Explosion	4	0.00	0	-
Fire	39	0.08	0	-
Flooding	173	0.14	3	0.67
Grounding, accidental	1,347	0.03	20	0.20
Grounding, intentional	92	0.15	1	0.00
Loss of electric power	30	0.00	1	0.00
Loss of vessel control	598	0.05	22	0.05
Personnel casualty	181	0.04	17	0.00
Pollution	586	1.00	45	1.00
Sinking	40	0.13	2	1.00
Structural failure	343	0.10	15	0.13
Total [1]	5,104	0.16	166	0.37

Source: USCG 2005c.

Note: Pollution fraction is the fraction of the causality events that produced pollution.

[1] Due to unknowns, not all causality types are listed.

Table 4.2-5
ERNS and Office of Emergency Services (OES) Recorded Incidents for EMT

Date of Event	Description
3/16/1994	Shipping line leak, 1 to 2 barrels (bbls)
3/28/1995	EMT Tank valve crack – 420 gallons crude released
9/13/1995	Pressure test on a barge loading line caused a leak – 5 gallons crude

Sources: CSOES 2005; ERNS 2003.

Risk Assessment Methodology

The risk assessment involves two areas: acute human impacts and impacts to the environment due to spills.

Assessing acute human impacts involves combining the hazardous scenario frequencies and impact distances with the conditional probabilities of events, meteorological conditions, and respective populations that could be exposed to each event. The risk analysis examines only the risks to the public. It does not examine risks to employees of Venoco, its contractors, or the barge Jovalan.

The first phase of the acute human risk assessment methodology is determining the hazardous scenarios that could occur at the project facilities as they are currently configured. These scenarios are then characterized by the possible consequences or impacts they could induce, such as explosion hazard zones and number of individuals affected. Often, each scenario consists of several events that have to occur before a hazardous consequence would occur. For example, a crude-oil tank failure has to be followed by a sizable crude-oil leak, followed by ignition and subsequent fire; members of the public would need to be present within the fire zone to be affected.

Meteorological conditions affect characteristics of releases that generate cloud effects, such as toxic and vapor cloud events. For toxic and vapor cloud events, a cigar-shaped cloud is produced downwind. The frequency of a given receptor experiencing a release is dependent on the wind blowing in the direction of that receptor. Overpressure, and to a lesser extent, fire thermal effects are wind independent and will affect the entire area within a given radius of the release point.

The risks of spills to the environment are assessed by examining the potential spill volumes and the spill frequencies. The level of risk is determined by the amount that a proposed project increases the spill volumes, the frequency (events per year), or the probability (percent chance that the event occurs over the project lifetime).

For oil spills into the marine or onshore environment, spill volumes are estimated based on vessel and tank sizes and pipeline throughputs. Spill frequencies are divided into the frequency of leaks or small spills, and the frequency of ruptures or large spills, with small spills being those of less than a few barrels and larger spills being those of 10 bbls (1.6 m^3) or more.

Previous documents covering the project facilities, such as the hazards analysis conducted by Venoco (Venoco 1999), were used to formulate the scenarios, the hazardous events frequencies, and the hazard zones for current operations. Additionally, recent studies from the Minerals Management Service (MMS) and failure frequency databases were used (CCPS 1989ab; CCPS 1997; CSFM 1993; HLID 1992; Lees 1996; MMS 2000; MMS 2001a; USDOT 2004a, 2004b; Sintef 1992; Rijnmond

1982). Current population information was utilized to estimate the population that could be affected by an accidental spill or release (U.S. Census Bureau 2005).

See Section 4.4, Hydrology, Water Resources, and Water Quality, and Section 4.5, Biological Resources, for discussions on the effects of oil spills on water and biological resources.

Existing Facility Risks

Existing facility risks involve the material release scenarios, the associated release volumes and impacts, the corresponding release frequencies, and the spill probabilities. Each of these is discussed below.

Hazardous Scenarios

A range of scenarios was developed in consideration of the project facilities. Each of these scenarios is discussed below.

<u>Crude-Oil Pipeline Release Scenarios</u>

These scenarios involve a full rupture or a leak in the crude-oil pipeline, Line 96, or the loading pipeline. Line 96 is discussed here because it is affected by some of the alternatives.

Line 96's leak detection system uses a supervisory control and data acquisition system type (SCADA-type) monitoring system (Mobil Pacific Pipeline Company 2001; Santa Barbara County 2003). Although this system can detect leak rates as low as a few barrels per hour, it might not detect smaller leaks, depending on the size of the leak, the leak location, and the characteristics of the fluid flow. Leak detection systems based on flow balancing are only as accurate as the margin of error in the flow meters and the associated equipment. The flow meter used on the Line 96 SCADA system is accurate to within 1 percent. Leaks smaller than this would be detected by visual inspection only. Pipeline ruptures have much greater spill volumes than do pipeline leaks, on the order of 10 to 1,000 or more barrels per hour (1.5 to 15.9 cubic meters per hour [m^3/hr]), depending on the size, terrain, and operating conditions of the pipeline.

In the event of a pipeline rupture on Line 96, the leak detection system should detect and isolate the spill within five minutes. Once the pipeline is shut down, the oil would continue to spill until it drains from the associated segments of the pipeline. The maximum spill volumes from the pipeline are a function of the location of the pipeline rupture in relationship to the isolation valves, check valves, and the pipeline elevation profile. If the leak detection system is not operational or is overridden by an operator, it is assumed that the pumping could continue for 30 minutes before a leak would be detected. Leak detection under this scenario would involve visual identification by employees or members of the public. Odors and visual aspects of the spill, in combination with the high population levels of the area, would most likely cause it to be detected within this period of time.

Crude-oil pipeline leaks are similar to the ruptures described above, except that they involve smaller sized releases from the pipeline. This distinction between leaks and ruptures accounts for the different failure frequencies that exist between them. Pipeline leaks occur more frequently than pipeline ruptures and are most commonly a result of corrosion and erosion of the steel in the pipeline. Ruptures are most often a result of third-party damage to the pipeline.

If there were a spill of crude oil onshore, there would be a potential for fire or toxic vapors along the Line 96 route or along the loading pipeline onshore route. Given the properties of crude oil, the likelihood of an explosion is virtually non-existent and, therefore, explosion scenarios are not addressed further in this document. This conclusion is based on modeling conducted for crude-oil spills to determine the rate of flammable vapor release and the potential for explosions (SBCFD 2000).

The loading pipeline extends from the pump house at the onshore EMT facilities to the barge Jovalan. A release from the loading line could produce an oil slick on the ocean surface that would produce toxic vapors and, if the slick were to encounter an ignition source, a fire. Leak detection capabilities on this pipeline are comprised of visual and odor monitoring by personnel during loading, by a low-pressure sensor and alarm located downstream of the loading pumps, by monitoring of the pressure recorder located at the onshore EMT facilities operations shack by personnel, and by balancing flows between the EMT meter and the barge vessel liquid levels, which are determined by hand measuring every two hours. Normal pump discharge pressure is approximately 150 psi (0.07 bar), and the low pressure alarm is set at 18 psi (1.24 bar) (as per piping and instrumentation diagrams [P&ID] 12181 revised May 15, 2004).

If a major rupture of the loading line were to occur during loading, the pressure in the pipeline would drop and the pressure sensor might alert the operators. However, based on the operating characteristics of the loading line and its terminus at the barge Jovalan, which is an atmospheric discharge location, it is estimated that releases that occur in the pipeline and loading hose offshore would not be detected by the low-pressure alarm. This was substantiated by modeling the flows using a pipe systems model PIPE-FLO®. This piping system model indicated that, for a 2- to 3-inch (5- to 7.6-centimeter) diameter hole in the hose or the sub-sea portion of the pipeline, the pressure drop would be less than 50 psi (3.4 bar) at the pumps and would not set off the low-pressure alarm. The leak rate of this scenario would be on the order of 40 percent of the flow given the leak occurs in the lowest portion of the pipeline. This would be considered a rupture.

If a leak occurred that was not detected by the low-pressure alarm and if the wind was away from the operators and/or the loading occurred at night or during periods of low visibility, the leak could continue for a number of hours before it was detected.

Impacts of a spill into the marine environment could present both environmental impacts and acute public health hazards in the form of fires or toxic vapors. Please see Section 4.4, Hydrology, Water Resources, and Water Quality, Section 4.5, Biological Resources, and Section 4.3, Air Quality, for impacts to the marine environment and to air quality.

EMT Equipment Release Scenarios

These scenarios involve a full rupture or leak from the crude-oil tanks, valves, or pumps at the onshore EMT facilities. The tanks are contained within berms, so a leak or rupture of the tanks would be contained within the berm area. The spilled crude oil would produce a toxic vapor cloud containing H_2S. If the spilled crude oil were to ignite, the resulting fire could produce thermal radiation effects on the surrounding area.

A rupture or a leak from the piping connections between the crude-oil tanks and the EMT pumps or between the Line 96 SCADA system meters and the tanks could cause a release of crude oil onto the onshore EMT property outside of the bermed areas. These releases would not be contained and oil could run offsite. A release from this area would also produce toxic and thermal impacts, if the spilled oil were to ignite.

Barge Release Scenarios

The shipping of crude oil to the barge Jovalan introduces the probability of a crude-oil spill into the ocean. Spills from the barge Jovalan could occur due to the following scenarios:

- Equipment failures, such as barge vessel wall failures or piping, connections or valve failures, due to equipment fatigue, operator error or fires;
- A failure of the mooring system resulting in a release of the barge and its subsequent grounding;
- A failure of the tug and assist vessel to moor the barge correctly, resulting in a release of the barge and its subsequent grounding;
- A collision between the barge and a third-party ship/boat or between the tug or assist vessel and the barge;
- Severe weather or visibility issues, causing increased probability of failure or mis-orientation of the tug while mooring; or
- Overfilling of barge compartments.

Any of these scenarios could cause a release of the vessel contents, resulting in a spill to the marine environment. During transport of the barge, scenarios could include groundings; collisions with other vessels, allisions with stationary objects, collision with the towing tug; loss of vessel control and subsequent grounding; or structural failures, etc.

Scenario Frequencies

Frequencies are discussed below for pipeline spills, for the EMT tank and piping spills, and for the barge Jovalan.

<u>Pipeline Release Frequencies</u>

While pipelines historically have had one of the lowest spill rates of any mode of oil transportation, there still is some level of risk that a pipeline could leak or rupture. In order to estimate the frequency of such an event and the probability of the event's occurrence over the lifetime of the Project, historic data for other operating liquid pipelines have been used.

Historically, spills from pipelines have been attributed to a number of different causes, including corrosion, defects in material or welding, damage from third-party interference, natural hazards such as earthquakes or landslides, and operational errors.

A number of different sources are used in this report to estimate the frequency of crude-oil pipeline spills. These include the U.S. Department of Transportation (DOT) databases (USDOT 2004a, 2004b) and the California State Fire Marshall (CSFM) databases and reports (CSFM 1993). Each of these is discussed below, and their estimates of pipeline spill frequencies are used to define a range of possible failure frequencies.

Information on the number and causes of pipeline spills in the United States greater than 50 barrels (7.9 m^3) in size is available from the DOT Office of Pipeline Safety (OPS). These data were obtained for spills occurring from 1968 to 2000; information prior to 1985 is less reliable in the OPS database. Information is available from the OPS for crude-oil-only pipelines, as well as for all liquid pipelines. In the years since 1985, crude oil has comprised 42 to 51 percent of the liquid spilled from pipelines, and petroleum products have made up 47 to 55 percent of the total volume spilled. Spills caused by corrosion rank as the most frequent cause, with an estimated 39 percent of all failures since 1985. The number of annual spills due to corrosion has remained in the same range since 1985, ranging from a high of 36 and 35 spills in 1987 and 1996, respectively, down to eight spills in 2000. The number of spills due to third-party impact ranks next, with 30 percent of the spills. The overall spill rate of crude oil pipelines with spill volumes greater than 50 barrels (7.9 m^3) was estimated to be 8.9×10^{-4} spills per mile-year (5.3×10^{-4} spills/km-year).

A CSFM report, *Hazardous Liquid Pipeline Risk Assessment* (CSFM 1993), analyzes leak information for the 7,800 miles (12,550 km) of liquid pipelines within California for the years 1981 through 1990. This study adjusted pipeline spill rates based on variables such as pipeline age, diameter, and operating temperature, as well as spill cause. The study found that external corrosion was the major cause of pipeline leaks, causing approximately 59 percent of spills, followed by third-party damage at 20 percent. Older pipelines and those that operate at higher temperatures had significantly higher spill rates. The CSFM base rate for pipeline spills of any size and operating conditions was calculated to be 9.89×10^{-3} incidents per mile-year (5.9×10^{-3}/km-year). Note that this is for crude oil only. Crude oil had the highest spill rate primarily due to the transportation of crude oil at elevated temperatures, which increases the rate of external corrosion. Faster corrosion rates occur at elevated temperatures when metal comes in contact with soil moisture.

Spill frequencies were estimated for the proposed Project using information on crude-oil pipeline spill rates available from the CSFM report. Although the CSFM study does not include offshore pipelines or pipelines that operate in batch mode (some pipelines in the CSFM report most likely do operate in batch mode, but the failure rate for these pipelines was not detailed), the CSFM data are considered to be the most conservative of the databases available, i.e., most protective of the environment. Pipelines that operate offshore are exposed to a more extreme environment, i.e., more corrosive, different set of third party impacts (boats, anchors, etc), than onshore pipelines and might be expected to have a higher failure rate. Batch pipelines, where the oil is moved in batches, experience greater pressure variations than continuously operating pipelines and may experience a higher failure rate.

However, the CSFM report did not identify a correlation between pressure and failure rate. And the CSFM indicated that the rates identified are generally higher than those identified in other studies. The MMS and DOT studies related to offshore pipeline failures (NRC 1990) found that marine pipelines (oil and gas) had an estimated failure rate of about $6x10^{-3}$ incidents per mile-year ($3.7x10^{-3}$ incidents/km-year) which is lower than the CSFM rates used in this study.

The CSFM report presents a set of hazardous liquid pipeline incident rates for all pipelines and uses. A review of the CSFM report shows that the following pipeline design and operation parameters can have a significant effect on pipeline spill rates:

- Pipeline age;
- Pipeline diameter;
- Pipe specification;
- Pipe type;
- Normal operating temperature;
- SCADA System;
- Cathodic protection system;
- Coating type; and
- Internal inspection.

Using the CSFM data and the criteria listed above, pipeline leak and rupture rates were calculated for Line 96 and the EMT loading line and are presented in Table 4.2-6.

Table 4.2-6
Current Operations Pipeline System Failure Rates and Probabilities

Pipeline and Scenario	Failure Rate (events per year)	Lifetime Spill Probability (percent) [2]
Line 96 - Leak	3.5×10^{-2}	30
Line 96 - Rupture	6.3×10^{-3}	6.2
EMT loading line – Leak on Land	1.14×10^{-2}	11
EMT loading line – Leak on Ocean	1.81×10^{-1}	84
EMT loading line - Rupture on Land [3]	8.36×10^{-5}	0.1
EMT loading line - Rupture on Ocean [3]	9.01×10^{-4}	0.9

[2] Based on a 10-year lifetime, probability of a single spill
[3] EMT line rupture rate applies only to while it is operating.

In addition to the pipeline releases, there could be releases from pipeline-associated equipment, such as valves, flanges, and hoses. The last section of the loading line is a hose, which would have a different failure rate than the metal piping. These failure rates are added to the pipeline failure rates to obtain a failure rate for the entire pipeline system. These rates are summarized below and detailed in Appendix C. In addition to the failure rate are the lifetime spill probabilities; the failure rates (in events per year) are used to develop the probability (in percent) of an oil spill over the project lifetime utilizing the MMS probability approach (MMS 2000, MMS 2001a).

The rupture and leak rates listed in Table 4.2-6 are greater than those estimated using the OPS failure rates. This is due to the operational characteristics of the pipeline, such as the pipeline age, the absence of internal inspections and some pipeline coating, as well as the addition of the pipeline system components.

Note that the probability of a leak from the pipeline systems is close to 95 percent (on land and the ocean). This is due to the higher failure rates leading to leaks from pipelines and associated equipment than for ruptures. Probabilities of a large release, or a rupture, are close to 1 percent for the loading line and 6 percent for the Line 96 over the life of the Project. Leaks could occur from the loading pipeline at any time because the loading pipeline is always full of oil. Ruptures could occur from the pipeline only during pumping operations.

Because seismic activity is a concern in California, seismically induced ruptures were examined in the CSFM database. Three of the 507 pipeline spills reported in the CSFM report for the 1981 to 1990 study period were related to seismic activity. Based on the total length of pipelines in the state (72,303 mile-years [116,336 kilometer-years]), and the number of spills (three) observed during this ten-year period, the base rate for seismically induced spills would be 4.15×10^{-6} spills per mile-year (2.49×10^{-6}/km-yr). This number has been included in the rupture rates in Table 4.2-6.

EMT Equipment Release Frequencies

The onshore EMT facilities equipment includes the two crude-oil tanks and the associated piping. Atmospheric tank, piping, pump, and valve failure rates are based on the database sources described above. A summary of the failure rates and the associated probabilities of a release over the project lifetime are summarized in Table 4.2-7 and detailed in Appendix C.

Table 4.2-7
Current Operations EMT Failure Rates and Probabilities

Scenario	Failure Rate (events per year)	Lifetime Spill Probability (percent) [4]
Rupture of crude oil piping - outside of tank berms	1.01×10^{-4}	0.1
Leak from crude oil piping - outside of tank berms	1.15×10^{-3}	1.1
Equipment Rupture - Inside of tank berms	4.60×10^{-4}	0.5
Equipment Rupture - sustained release during pumping	1.9×10^{-5}	<0.1

[4] Based on a 10-year lifetime, probability of a single spill.

The probabilities of leaks and ruptures from the EMT equipment are 1 percent and less, respectively, over the life of the Project. This is due to the low number of components and piping lengths, the presence of operators during transfer operations, and the relatively low frequency of barge pumping operations.

Barge Jovalan Release Frequencies

A number of studies have examined the rate at which tankers, barges, and terminals produce spills. These studies have produced a range of spill rates for a range of vessel and terminal types. This range is used to define a spill rate for the EMT barge operations.

The CSLC has been tracking spills from marine terminals since 1992. A total of 128 spills, varying in size from a teaspoon to 1,092 gallons (26 bbls or 4.1 m^3), occurred during the 10 years from 1992 through 2001. This equates to approximately 13 spills per year. Terminals were responsible for approximately 57 percent of the spills, while vessels were responsible for the remaining 43 percent. This equates to approximately one release for every 219 vessel calls (CSLC 2004).

Table 4.2-8 below lists accident rates reported by different studies, including studies from the Massachusetts Institute of Technology (Lin et al. 1998), USCG (Waters et al. 1999), Etkin and Neel, CSLC, Aspen Environmental Group, and the Federal Emergency Management Agency (FEMA).

Based on the data above, the frequency of a barge release is estimated as 2.0 x 10^{-3} per terminal visit, or once every 506 transits (the 43 percent of releases attributable to the barge).

Releases from the barge while in transit either to Los Angeles or San Francisco are based on USGS causality and pollution incidents while at sea in U.S. waters (shown in Table 4.2-9). The risks associated with pollution incidents at sea is a function of a number of different variables, including the ocean roughness and wave heights, currents, water temperature, proximity to land, other vessel traffic, length of route, etc. The northern route, to San Francisco, is a longer route, experiences greater ocean roughness, larger waves and more serious weather conditions. However, the southern route, to Los Angeles, is closer to land and has more vessel traffic. Therefore, it is difficult to determine which route presents a greater probability of spills and each has been given the same frequency of causalities on a per transit basis.

In addition to the historical failure rates listed above, detailed fault trees have been developed for the period when the barge is located at the offshore terminal at Coal Oil Point. This analysis was conducted due to the different operating characteristics of an offshore terminal from those of an onshore terminal, such as less traffic, more exposure to currents and wind, etc. Frequencies of other contributing events listed in the scenarios section above are detailed in the barge Jovalan fault trees shown in Appendix C.

Historical data on leaks, as examined by past studies, were used in order to estimate the size distribution of leaks. These studies include the CSLC spills data and Shore Terminal EIR, the USCG, Cutter, and Aspen. The Cutter and Aspen studies estimated that 54 percent of all spills are less than 1 gallon (0.004 m^3), 70 percent less than 10 gallons (0.04 m^3), 86 percent less than 100 gallons (0.4 m^3), and 95 percent less than 1,000 gallons (3.8 m^3) (Cutter 1989, and Aspen 1992). This correlates approximately with the spill size distributions for all ships on a national level as reported by the USCG annual reports (USCG 2005b) over the last 10 years. However, the USCG reports also indicate probabilities of spills sizes greater than 10,000 gallons (38 m^3) (0.21 percent) and greater than 100,000 gallons (378 m^3) (0.025 percent).

The estimated frequency and probability of a release from the barge Jovalan are shown in Table 4.2-9. Small releases are associated with pipe, fitting, valve and flange leaks and would be on the order of a few barrels. Large releases are associated with pipe ruptures and holes in the barge tank walls due to loss of tug control, vessel collisions, grounding, etc and would be 10 bbls (1.6 m^3) or more. Large spills are driven by the tug maneuvering and subsequent barge grounding scenario, the visibility scenario and the collision with another vessel scenario.

Using either the historical approach or the fault tree approach leads to similar spill rates.

Table 4.2-8
Vessel Accident Rates

Study/ Source	Years, Range	Ships/ Conditions Involved	Type of Accident	Frequency per transit
MIT	1981–1995	Barge trains	Collisions in port	0.18 - 2.3 x 10^{-3}
MIT	1981–1995	Barge trains	Grounding in port	0.69 - 8.5 x 10^{-3}
USCG	1992–1998	All US ports, all vessels	Allisions, Collisions, Groundings (ACG)	2.5 x 10^{-4}
USCG	1992–1998	Ships	ACGs at sea only	3.1 x 10^{-4}
Etkin and Neel	1993–1999	Tankers/barges	Per transit in California, resulting in a spill	2.0 x 10^{-3}
CSLC	1992–2001	Barges	Spills per call, 43 percent due to vessel	4.6 x 10^{-3}
Aspen	-	Tankers/barges	"at-pier" spills > 1,000 bbls	9.5 x 10^{-5}
FEMA	1980–1988	In harbors/bays	Collisions and groundings	1.0 x 10^{-3}
FEMA	1980–1988	In harbors/bays	Collisions while moored	2.0 x 10^{-4}

Note: These commercial vessel accidents meet a reportable level defined in 46 CFR 4.05, but do not include commercial fishing vessel or recreational boating casualties.
Collisions (between two moving vessels), Allisions (between a moving vessel and a stationary object, including another vessel).

Source: Lin et al. 1998 (MIT); Waters et al. 1999 (USCG); CSLC 2004, Etkin and Neel, 2000; Aspen Environmental Group 1992.

Table 4.2-9
Current Operations Barge Failure Rates and Probabilities

Scenario	Failure Rate (events per year)	Lifetime Spill Probability (percent) [5]
Historical Analysis		
Spill size < 1 gallon frequency	2.5×10^{-2}	21.8
Spill size > 1 gallon frequency	2.1×10^{-2}	18.9
Spill size > 10 gallon frequency	1.4×10^{-2}	12.8
Spill size > 100 gallon frequency	6.4×10^{-3}	6.2
Spill size > 1,000 gallon frequency	2.3×10^{-3}	2.2
Spill size > 10,000 gallon frequency	9.5×10^{-5}	0.1
Spill size > 100,000 gallon frequency	1.1×10^{-5}	0.01
Fault Tree Analysis		
Large spill from the barge at Coal Oil Point	9.9×10^{-3}	9.4
Smaller spill from the barge at Coal Oil Point	2.5×10^{-2}	22.31
Spill from barge in transit to SF or LA	2.6×10^{-3}	2.6

[5] Based on a 10-year lifetime, probability of a single spill.

Scenario Consequences

Scenario consequences are either acute human impacts or impacts due to spills of crude oil into the environment. Each of these is discussed below.

<u>Spills to the Environment</u>

Spills to the environment would have an impact on marine and biological resources at the EMT or along the study area routes. The impacts would be a function of where the crude is spilled, the amount that is spilled, and the sea and weather conditions.

<u>Spill Volumes</u>

The Environmental Protection Agency (EPA), the USCG, and the CSLC have specified methods for calculating three levels of spill planning volumes for use in determining the minimum amount of spill response equipment/capability that must be available within specified time frames to respond to the spill. These are discussed below.

Terminal Reasonable Worst-Case Discharge (WCD)

The Reasonable WCD planning volume is defined by California Regulations as the portion of the line fill capacity that could be lost during a spill, taking into account the availability and location of the emergency shut-off controls, plus the amount that may be "reasonably expected" to be released during emergency shut-off of the transfer if a hose ruptures.

The WCD volumes were based on drain down of all the pipelines containing oil, including the amount that could be pumped out of the pipelines during the time it takes to detect the release (assumed to be five minutes), plus the time it takes to shut down the pumps (assumed to be one minute). A one-hour duration for a catastrophic release is also included because there is a reasonable probability that a leak could go undetected for this period of time.

Terminal Maximum Most Probable (Medium) Discharge

The USCG defines this discharge as the lesser of 1,200 bbls (191 m^3) or 10 percent of the volume of the WCD.

Terminal Average Most Probable (Small) Discharge

The EPA defines the average most probable discharge as 50 bbls (7.9 m^3), not to exceed the WCD, while the USCG defines it to be the lesser of 50 bbls (7.9 m^3) or one percent of the WCD.

Barge Worst-Case and Reasonable Worst-Case Discharges

In addition, if the barge were to experience a catastrophic failure, the volume of at least one of the barge compartments could discharge into the environment. The barge compartments on the barge Jovalan hold 7,300 (6 compartments), 5,100 (2), 5,200 (2), 1,430 (2) and 1,420 (2) bbls (1,160.6, 810.8, 826.7, 227.4, and 225.8 $m^{3)}$, for a total capacity of 70,100 bbls (11,145 m^3). For the heavier API 22 crude oil at the EMT, the barge Jovalan can carry 56,000 bbls (8,903 m^3). As per the Harley Marine Services Vessel Spill Contingency Plan, the worst-case and reasonable worst-case discharges for the barge Jovalan are shown below.

The planning volumes and the catastrophic release volume for the EMT are also shown in the in Table 4.2-10 below.

Table 4.2-10
Crude Discharge Planning Volumes

Scenario	Discharge Volume (bbls)	Discharge Volume (gallons)
Barge Worst-Case Discharge	56,000	2,352,000
Barge Reasonable Worst-Case Discharge	14,000	588,000
Terminal Catastrophic Discharge	4,598	193,100
Terminal Worst-Case Discharge	818	34,345
Terminal Maximum Most Probable Discharge	82	3,434
Terminal Average Most Probable Discharge	8 – 50 [6]	343 – 2,100

[6] 8 bbls is 1 percent of WCD and 50 bbls is the EPA minimum.

Estimating the spill size from a sub-sea pipeline involves a number of variables, including oil density and temperature related to the ocean density and temperature, depth of leak location, pipeline pressure, and flow rates, etc. The MMS has developed the Pipeline Oil Spill Volume Computer Model (POSVCM, MMS 2001b), which estimates the spill sizes from sub-sea pipelines. Modeling conducted for the EMT loading line indicates a spill volume of close to 425 bbls (17,850 gallons or 67.6 m^3), which is approximately half the estimated terminal WCD listed above and is essentially equal to the amount of pumping that would take place before a leak is detected and the pumps are shut in. The MMS model essentially estimates that, in the event of a spill, most of the oil would remain in the pipeline and that the spill volume would be due to the pumping.

The MMS model estimates that during periods when there is no pumping and the EMT loading line is not under pressure but is left full of oil, between 1 and 5 bbl (0.004 and 0.019 m^3) of oil would be released from the pipeline if a hole develops in the sub-sea piping or equipment.

<u>Spill Areas</u>

The area that could be affected by a spill is a function of the location of the spill and the spill volumes. Volumes that could be spilled are discussed above.

Onshore Spills

A spill that occurs in the EMT onshore area outside of the berm areas around the tank would follow the contour of the land. The contours would drain the crude oil downhill in a southerly direction past the shipping pumps toward the beach area and the depression between the beach area and the pumps.

Offshore Spills

The fate of oil spilled into the marine environment is influenced by a number of different variables, primarily wind speed and direction, ocean currents, ocean conditions, and oil characteristics. Models to estimate the fate of oil spills have been developed by a number of different sources, including the MMS and NOAA. Modeling was conducted as part of this Project using two different models: the MMS Oil Spill Risk Analysis model (OSRA) (MMS 2000) and the NOAA model GNOME (General NOAA Oil Modeling Environment) (NOAA 2002). Modeling results for the analysis are shown in Appendix C. In summary, depending on conditions, spills from the terminal facilities could impact the coast and beaches as far north as Point Purisima and as far south as the Channel Islands and Point Dume south of Oxnard.

The highest probability of impact from a spill at the terminal is the coastline adjacent to the terminal operations. Depending on the meteorological conditions, the MMS GNOME model estimates that up to 69 percent of spilled oil would end up on the beaches. See Appendix C for details of the oil spill modeling.

Impacts from barge spills that occur during its transit are dependent on the location of the barge and the wind strength and direction, as well as ocean currents and conditions. MMS Gnome modeling conducted for a spill 15 nm (28 km) offshore Morro Bay indicates that impacts could range from the nearest coastline to as far south as the Channel Islands (80 miles [129 km]) over a period of 10 days. Impacts to the north, under southerly wind scenarios, would be expected to be similar; the GNOME model does not have tide and current information for areas north of Morro Bay.

Acute Human Impacts

Acute consequences to humans would include the exposure of nearby populations to toxic gasses that evaporate from spilled crude oil and the exposure to nearby populations of thermal radiation from a fire if the spilled crude ignited.

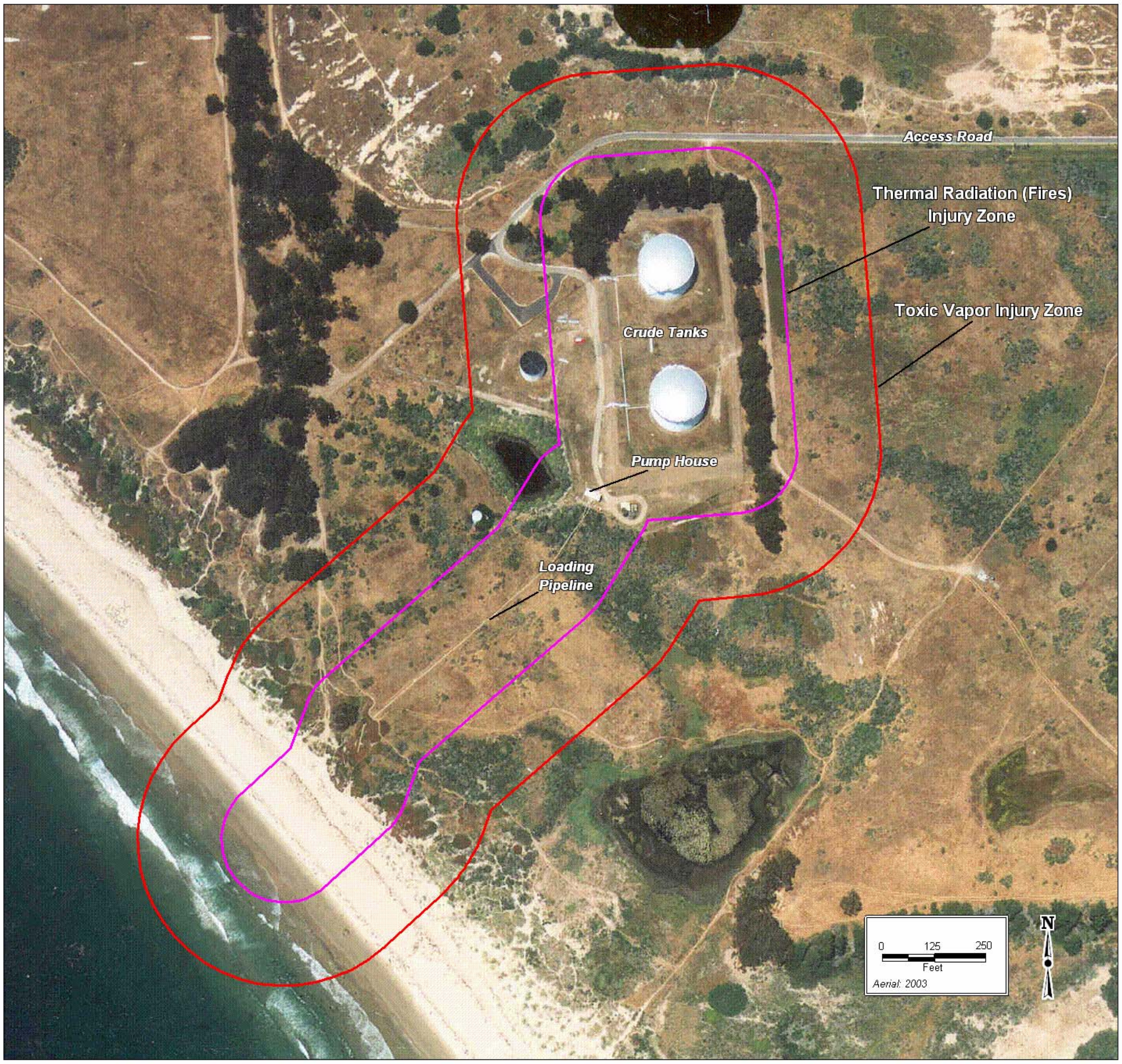
Statistics maintained by the DOT OPS indicate a low probability of public safety impacts related to crude oil transportation (USDOT 2004a, 2004b). This database indicates that there have been no fatalities, and that over a 14-year period, only nine out of 841 crude-oil pipeline incidents in the United States have led to injuries. For the period from 1968 to 1985, there were eight incidents associated with crude-oil pipelines that resulted in fatalities and 12 incidents that resulted in injuries. It is unclear from the OPS database if these incidents occurred at or near other processing equipment; the presence of processing equipment would increase the probability of fires and injuries/fatalities to oil field employees. The CSFM's Hazardous Liquid Pipeline Risk Assessment report (CSFM 1993) indicates that, over a 10-year period, there have been no injuries or fatalities associated with crude-oil pipeline spills in California.

For the EMT and loading pipeline, the PLG analysis estimated that the closest residential populations are located outside the estimated distance from acute toxic impacts that could produce injuries, or the ERPG-2 distance of 350 feet (108 m) (Wallace, Roberts & Todd 1997). Because the Ellwood Mesa and beach areas are frequented by recreational users, such as joggers, bicyclists, and walkers, some members of the public might be in the vicinity of a spill. However, the conditional probability of persons being within the hazard zones, combined with the probability of the exposure producing serious injuries, would place the risks in the green region of the Santa Barbara County Safety Element (Santa Barbara County 2000).

Figure 4.2-3 below shows the size of the toxic and thermal radiation hazard zones. Fatality zones would not extend beyond the facility boundaries.

Crude-oil fires could produce serious injury impacts from a thermal exposure level of 5 kilowatts per square meter (kW/m^2), at a distance of 150 feet (46 m) (SBCFD 2000). When combined with the conditional probability of ignition, which would be low given the few ignition sources in the area, and the conditional probability of persons being near the EMT or the barge at the time of the spill, risk of exposure to a crude oil fire would be in the acceptable region of the Santa Barbara County Safety Element. However, there would still be a risk of injury from the operations since the Ellwood Mesa and beach areas are frequented by recreational users, and some members of the public might be in the vicinity of a spill.

Figure 4.2-3
EMT Hazard Zones



Crude-oil fires could produce serious injury impacts from a thermal exposure level of 5 kW/m^2, at a distance of 150 feet (46 m) (SBCFD 2000). When combined with the conditional probability of ignition, which would be low given the few ignition sources in the area, and the conditional probability of persons being near the EMT or the barge at the time of the spill, risk of exposure to a crude oil fire would be low, but not zero, because there would still be a risk of injury from the operations to members of the public in recreational areas in the immediate vicinity of the EMT.

For the Line 96 pipeline route, residential areas and the Ellwood School are located within the injury hazard zones, both thermal and toxic. As mentioned above, the conditional probability of the released crude oil igniting is relatively small. Therefore, risks of thermal impacts from a crude-oil fire are low. However, there would still be a risk of injury from the operations due to the location of residences and public areas in the vicinity of the pipeline route, and the potential for injuries from toxic vapors impacting residences and members of the public.

Risks from exposure to toxic vapors from a crude-oil spill along Line 96 are estimated based on the fraction of the pipeline that is in close proximity to residential areas, the conditional probability of meteorological conditions that could affect residential areas, and the conditional probability of a person experiencing injuries given an exposure. Line 96 runs approximately 2 miles (3.2 km) within residential areas (including areas in front of the Ellwood School and the residences along Hollister Avenue, Pacific Oaks, and Phelps Road). This would produce a failure rate for this section of the pipeline of approximately 4.1×10^{-3} ruptures per year.

Environmental impacts associated with crude-oil spills are discussed in Section 4.4, Hydrology, Water Resources, and Water Quality, and Section 4.5, Biological Resources.

4.2.2 Regulatory Setting

Many laws and regulations regulate marine terminals, vessels calling at marine terminals, security, and emergency response/contingency planning. Responsibilities for enforcing or executing these laws and regulations fall to various international, Federal, State, and local agencies. The various agencies and their responsibilities are summarized below.

International Maritime Organization (IMO)

The major body governing the movement of goods at sea is the IMO, which does so through a series of international protocols. Individual countries must approve and adopt these protocols before they become effective. The International Convention for the Prevention of Pollution from Ships (MARPOL 73/78 and amendments) governs the movement of oil and specifies tanker construction standards and equipment requirements. Regulation 26 of Annex I of MARPOL 73/78 requires that every tanker of 150 tons gross tonnage and above shall carry on board a shipboard oil pollution emergency plan approved by IMO. The U.S. implemented MARPOL 73/78 with passage of the Act of 1980 to Prevent Pollution from Ships. The IMO has also issued "Guidelines for the Development of Shipboard Oil Pollution Emergency Plans" to assist tanker owners in preparing such plans that comply with the cited regulations and to assist governments in developing and enacting domestic laws that give force to and implement the cited regulations. Plans that meet the 1990 Oil Pollution Act (OPA 90) and the Lempert-Keene-Seastrand Oil Spill Prevention and Response Act (California SB 2040) requirements also meet IMO requirements. Traffic Separation Schemes (TSSs), must be approved by the IMO, such as the approved TSSs off the entrances to San Francisco Bay and the Santa Barbara Channel.

The IMO adopted an amendment to the International Convention for Safety of Life at Sea (SOLAS) with provisions entitled "Special Measures to Enhance Maritime Safety," which became effective in 1996. These provisions allow for operational testing during port state examinations to ensure that masters and crews for both U.S. and international vessels are familiar with essential shipboard procedures relating to ship safety. The USCG Marine Safety Office conducts these port state examinations as part of their vessel inspection program.

Federal

A number of Federal laws regulate marine terminals and vessels. These laws address, among other things, design and construction standards, operational standards, and spill prevention and cleanup. Regulations to implement these laws are contained primarily in Titles 33 (Navigation and Navigable Waters), 40 (Protection of Environment), and 46 (Shipping) of the Code of Federal Regulations (CFR). The most recent act to address spill prevention and response is OPA 90.

Key laws addressing oil pollution include:

- OPA 1990;
- Federal Water Pollution Control Act of 1972;
- Clean Water Act of 1977;
- Water Quality Act of 1987;
- Act of 1980 to Prevent Pollution from Ships;
- Resource Conservation and Recovery Act (RCRA) of 1978;

- Hazardous and Solid Waste Act of 1984, and;
- Refuse Act of 1899.

Responsibilities for implementing and enforcing the Federal regulations addressing terminals, vessels, and pollution control fall to a number of agencies, as described in the following sections.

United States Coast Guard (USCG)

The USCG, through Title 33 (Navigation and Navigable Waters) and Title 46 (Shipping) of the CFR, is the Federal agency responsible for vessel inspection, marine terminal operations safety, coordination of Federal responses to marine emergencies, enforcement of marine pollution statutes, marine safety (navigation aids, etc.), and operation of the National Response Center (NRC) for spill response, and is the lead agency for offshore spill response. The USCG implemented a revised vessel boarding program in 1994 designed to identify and eliminate substandard ships from U.S. waters. The program pursues this goal by systematically targeting the relative risk of vessels and increasing the boarding frequency on high risk (potentially substandard) vessels. Each vessel's relative risk is determined through the use of a matrix that factors the vessel's flag, owner, operator, classification society, vessel particulars, and violation history. Vessels are assigned a boarding priority from I to IV, with priority I vessels being the potentially highest risk. The USCG is also responsible for reviewing marine terminal Operations Manuals and issuing Letters of Adequacy upon approval. At the present time, the USCG relies on the CSLC to review Operations Manuals and inspect terminals. The USCG issued regulations under OPA 90 addressing requirements for response plans for tank vessels, offshore facilities, and onshore facilities that could reasonably expect to spill oil into navigable waterways.

Because studies have shown that the use of double-hull vessels will decrease the probability of spills when tank vessels are involved in accidents, the USCG issued regulations addressing double-hull requirements for tank vessels. The regulations establish a timeline for eliminating single-hull vessels from operating in the navigable waters or the Exclusive Economic Zone of the United States after January 1, 2010, and eliminating existing double-bottom or double-sided vessels by January 1, 2015. Only vessels equipped with a double hull, or with an approved double containment system will be allowed to operate after those times. The phase-out timeline is a function of vessel size, age, and whether it is equipped with a single hull, double bottom, or double sides. The phase out began in 1995 with 40-year-old or older vessels equipped with single hulls between 5,000 and 30,000 gross tons (4,536 and 27,216, metric tons), 28 year or older vessels equipped with single hulls over 30,000 gross tons (27,216 metric tons), and 33 year or older vessels equipped with double bottoms or sides over 30,000 gross tons (27, 216 metric tons). All new tankers delivered after 1993 must be double hulled. Double-bottom or double-sided vessels can essentially operate 5 years longer than single-hull vessels.

Title 46, part 151 addresses construction requirements related to bulk barges.

Title 33, part 157 addresses double hulled requirements for tankers and barges.

Title 33, section 154 specifies a number of requirements related to bulk transfer of oil including:

- Operations manual requirements;
- Equipment requirements, including hose requirements, closure devices and containment requirements, and;
- Emergency response plans.

In regards to an emergency response plan, sections 154.1030 through 154.1055 specify the response plan contents, including:

- Notification procedures;
- Spill mitigation procedures;
- Response activities;
- Fish and wildlife and sensitive environments;
- Disposal plan;
- Training and exercises procedures;
- Equipment lists and records;
- Communications plan; and
- Safety and health plan.

The USCG also oversees the Preparedness For Response Exercise Program (PREP), which went into effect on January 1, 1994, for all participants, provides an exercise program that meets the intent of OPA 90. There are four Federal agencies with primary regulatory oversight that jointly developed the PREP: the USCG, the EPA, the Research and Special Programs Administration OPS, and the MMS.

The four regulatory agencies have agreed that participation in PREP will satisfy all exercise requirements imposed by OPA 90. Participation in PREP is not required.

PREP is structured around a system of internal and external exercises. The internal exercises are conducted wholly within a plan holder's organization, testing the various components of a response plan to ensure the plan is adequate for the organization to respond to an oil discharge. Internal exercises include:

- Qualified Individual Notification drills;
- Emergency Procedure Drills for vessels and barges;
- Spill Management Team Tabletop Exercises;
- Equipment Deployment Exercises; and
- Unannounced Exercises.

U.S. Coast Guard Maritime Security (MARSEC) Levels

The Coast Guard has a three-tiered system of Maritime Security (MARSEC) levels consistent with the Department of Homeland Security’s Homeland Security Advisory System (HSAS). MARSEC Levels are designed to provide a means to easily communicate pre-planned scalable responses to increased threat levels. The Commandant of the U.S. Coast Guard sets MARSEC levels commensurate with the HSAS. Because of the unique nature of the maritime industry, the HSAS threat conditions and MARSEC levels will align closely, though they will not directly correlate.

MARSEC levels are set to reflect the prevailing threat environment to the marine elements of the national transportation system, including ports, vessels, facilities, critical assets, and infrastructure located on or adjacent to waters subject to the jurisdiction of the U.S.

MARSEC Level 1 means the level for which minimum appropriate security measures shall be maintained at all times. MARSEC 1 generally applies when HSAS Threat Condition Green, Blue, or Yellow are set.

MARSEC Level 2 means the level for which appropriate additional protective security measures shall be maintained for a period of time as a result of heightened risk of a transportation security incident. MARSEC 2 generally corresponds to HSAS Threat Condition Orange.

MARSEC Level 3 means the level for which further specific protective security measures shall be maintained for a limited period of time when a transportation security incident is probable, imminent, or has occurred, although it may not be possible to identify the specific target. MARSEC 3 generally corresponds to HSAS Threat Condition Red.

When the Coast Guard determines that additional security measures are necessary to respond to a threat assessment or to a specific threat against the maritime elements of the national transportation system, the Coast Guard may issue a MARSEC Directive setting forth mandatory measures. Each facility owner or operator must comply with any instructions contained in a MARSEC Directive issued by the Commandant of the Coast Guard.

Each owner or operator of a vessel or facility required to have a security plan under 33 CFR parts 104, 105 or 106 that receives a MARSEC Directive must comply with the specifications in 33 CFR 101.405. The security plan must address the following elements:

- Security measures for access control;
- Security measures for restricted areas;
- Security measures for handling cargo;
- Security measures for delivery of vessel stores and bunkers; and
- Security measures for monitoring.

Details on the requirements for access control and restricted areas, the most applicable to the EMT, are discussed below.

At MARSEC Level 1, the facility owner or operator must ensure the following security measures are implemented at the facility:

- Screen persons, baggage (including carry-on items), personal effects, and vehicles, including delivery vehicles for dangerous substances and devices;
- Conspicuously post signs that describe security measures currently in effect;
- Check the identification of any person entering the facility;
- Designate restricted areas and provide appropriate access controls for these areas;
- Identify access points that must be secured or attended in order to deter unauthorized access;
- Deter unauthorized access to the facility and to designated restricted areas within the facility;
- Screen by hand or device, such as x-ray, all unaccompanied baggage prior to loading onto a vessel;
- Patrolling or monitoring the perimeter of restricted areas; and
- Using security personnel, automatic intrusion detection devices, surveillance equipment, or surveillance systems to detect unauthorized entry or movement within restricted areas.

In addition to the security measures required for MARSEC Level 1, at MARSEC Level 2 the facility owner or operator must also ensure the implementation of additional security measures. These additional security measures may include:

- Increasing the frequency and detail of the screening of persons, baggage, and personal effects for dangerous substances and devices entering the facility;
- Assigning additional personnel to guard access points and patrol the perimeter of the facility to deter unauthorized access;

- Limiting the number of access points to the facility by closing and securing some access points and providing physical barriers to impede movement through the remaining access points;
- Deterring waterside access to the facility, which may include using waterborne patrols to enhance security around the facility;
- Increasing the intensity and frequency of monitoring and access controls on existing restricted access areas; and
- Reducing the number of access points to restricted areas, and enhancing the controls applied at the remaining access points.

In addition to the security measures required for MARSEC Level 1 and MARSEC Level 2, the facility owner or operator must ensure the implementation of additional security measures, as specified for MARSEC Level 3 in their approved Facility Security Plan. These additional security measures may include:

- Granting access to only those responding to the security incident or threat thereof;
- Suspending access to the facility;
- Suspending cargo operations;
- Evacuating the facility; and
- Increasing security patrols within the facility.

Environmental Protection Agency (EPA)

The EPA is responsible for the National Contingency Plan and acts as the lead agency in response to an onshore spill. EPA also serves as co-chairman of the Regional Response Team, which is a team of agencies established to provide assistance and guidance to the on-scene coordinator (OSC) during the response to a spill. The EPA also regulates disposal of recovered oil and is responsible for developing regulations for Spill Prevention, Control, and Countermeasures (SPCC) Plans. SPCC Plans are required for non-transportation-related onshore and offshore facilities that have the potential to spill oil into waters of the United States or adjoining shorelines.

Department of Commerce through the National Oceanic and Atmospheric Administration (NOAA)

NOAA provides scientific support for response and contingency planning, including assessments of the hazards that may be involved, predictions of movement and dispersion of oil and hazardous substances through trajectory modeling, and information on the sensitivity of coastal environments to oil and hazardous substances. They also provide expertise on living marine sources and their habitats, including endangered species, marine mammals and National Marine Sanctuary ecosystems, information on actual and predicted meteorological, hydrological, and oceanographic conditions for marine, coastal, and inland waters, and tide and circulation data for coastal waters.

Department of the Interior (DOI)

DOI, through its various offices, provides expertise during spills in a number of areas, as described below:

- U.S. Fish and Wildlife Service (USFWS) – Anadromous and certain other fishes and wildlife, including endangered and threatened species, migratory birds, and certain marine mammals; waters and wetlands; and contaminants affecting habitat resources;

- U.S. Geological Survey (USGS) – Geology, hydrology (groundwater and surface water), and natural hazards.

Department of Defense (DOD)

DOD, through the U.S. Army Corps of Engineers (Corps), is responsible for reviewing all aspects of a project and/or spill response activities that could affect navigation. The Corps has specialized equipment and personnel for maintaining navigation channels, removing navigation obstructions, and accomplishing structural repairs.

Department of Transportation (DOT)

Hazardous liquid pipelines are under the jurisdiction of the DOT and must follow the regulations in 49 CFR Part 195, Transportation of Hazardous Liquids by Pipeline, as authorized by the Hazardous Liquid Pipeline Safety Act of 1979 (49 CFR 2004). Other applicable Federal requirements are contained in 40 CFR Parts 109, 110, 112, 113, and 114, pertaining to the need for Oil SPCC Plans; 40 CFR Parts 109–114 promulgated in response to the Oil Pollution Act of 1990, as well as the Outer Continental Shelf Lands Act. 49 CFR Part 195 also addresses pipeline integrity management plans.

Overview of the 49 CFR 195 Requirements

Part 195.30 incorporates many of the applicable national safety standards of the:

- American Petroleum Institute (API);
- American Society of Mechanical Engineers (ASME);
- American National Standards Institute (ANSI); and
- American Society for Testing and Materials (ASTM).

Part 195.50 requires reporting of accidents by telephone and in writing for:

- Spills of 50 barrels (2,100 gallons or 7.9 m^3) or more;
- Daily loss of 5 barrels a day (0.8 m^3) to the atmosphere;
- Death or serious injury of a person; or
- Damage to property of operator or others greater than $5,000.

The Part 195.100 series includes design requirements for the temperature environment, variations in pressure, internal design pressure for pipe specifications, external pressure and external loads, and new and used pipes, valves, fittings, and flanges.

The Part 195.200 series provides construction requirements for standards such as compliance, inspections, welding, siting and routing, bending, welding and welders, inspection and nondestructive testing of welds, external corrosion and cathodic protection, installing in-ditch and covering, clearances and crossings, valves, pumping, breakout tanks, and construction records.

The Part 195.300 series prescribes minimum requirements for hydrostatic testing, compliance dates, test pressures and duration, test medium, and records.

The Part 195.400 series specifies minimum requirements for operating and maintaining steel pipeline systems, including:

- Correction of unsafe conditions within a reasonable time;
- Procedural manual for operations, maintenance, and emergencies;
- Training;
- Maps;
- Maximum operating pressure;
- Communication system;
- Cathodic protection system;
- External and internal corrosion control;
- Valve maintenance;
- Pipeline repairs;
- Overpressure safety devices;
- Firefighting equipment; and
- Public education program for hazardous liquid pipeline emergencies and reporting.

Part 195.452 addresses Pipeline Integrity Management Plans (IMP) in High Consequence Areas for Hazardous Liquid Operators which were effective May 29, 2001, and February 15, 2002. IMPs specify regulations to assess, evaluate, repair and validate, through comprehensive analysis, the integrity of hazardous liquid pipeline segments that, in the event of a leak or failure, could affect populated areas, areas unusually sensitive to environmental damage, and commercially navigable waterways.

<u>Overview of 40 CFR Parts 109, 110, 112, 113, and 114</u>

The SPCC covered in these regulatory programs apply to oil storage and transportation facilities and terminals, tank farms, bulk plants, oil refineries, and production facilities, as well as bulk oil consumers, such as apartment houses, office buildings, schools, hospitals, farms, and State and Federal facilities.

Part 109 establishes the minimum criteria for developing oil-removal contingency plans for certain inland navigable waters by State, local, and regional agencies in consultation with the regulated community, i.e., oil facilities.

Part 110 prohibits discharge of oil such that applicable water quality standards would be violated, or that would cause a film or sheen upon or in the water. These regulations were updated in 1987 to adequately reflect the intent of Congress in section 311(b) (3) and (4) of the Clean Water Act, specifically incorporating the provision "in such quantities as may be harmful."

Part 112 deals with oil spill prevention and preparation of SPCC Plans. These regulations establish procedures, methods, and equipment requirements to prevent the discharge of oil from onshore and offshore facilities into or upon the navigable waters of the United States. These regulations apply only to non-transportation-related facilities.

Part 113 establishes financial liability limits; however, these limits were preempted by OPA 1990.

Part 114 provides civil penalties for violations of the oil spill regulations.

<u>OPA 1990. Public Law 101-380 (H.R.): August 18, 1990</u>

OPA 90 was enacted to expand prevention and preparedness activities, improve response capabilities, ensure that shippers and oil companies pay the costs of spills that do occur, and establish an expanded research and development program. The Act also establishes a $1 billion Oil Spill Liability Trust Fund, funded by a tax on crude oil received at refineries. A Memorandum of Understanding (MOU) was established to divide areas of responsibility. The USCG is responsible for tank vessels and marine terminals, the EPA for tank farms, and the Research and Special Programs Administration (RSPA) for pipelines. Each of these agencies has developed regulations for their area of responsibility.

All facilities and vessels that have the potential to release oil into navigable waters are required by OPA 90 to have up-to-date oil spill response plans and to have submitted them to the appropriate Federal agency for review and approval. Of particular importance in OPA 90 is the requirement for facilities and vessels to demonstrate that they have sufficient response equipment under contract to respond to and clean up a worst-case spill.

The OPA affirms the rights of states to protect their own air, water, and land resources by permitting them to establish State standards which are more restrictive than Federal standards. Specifically, section 106 explicitly preserves the authority of any state to impose its own requirements or standards with respect to discharges of oil.

State

California State Lands Commission (California Code of Regulations [CCR] Title 2, Division 3, Chapter 1)

The CSLC Marine Facilities Division is responsible for regulating and inspecting marine terminals. Through two California Code of Regulations (CCR) § 2300 through 2571, the Marine Facilities Division established a comprehensive program to minimize and prevent spills from occurring at marine terminals, and to minimize spill impact should one occur. These regulations established a comprehensive inspection-monitoring plan whereby CSLC inspectors monitor transfer operations on a continuing basis. An inspection is conducted annually, and the EMT was subject to a comprehensive “audit,” including underwater and above wharf, structural inspection in July, 1999. The standards generated by the proposed Marine Oil Terminal Engineering and Maintenance Standards (MOTEMS) provide specific requirements for subsequent audits and engineering inspections.

CSLC’s marine terminal regulations are similar to, but more comprehensive than, Federal regulations in the area of establishing exchange of information between the terminal and vessels, information that must be contained in the Declaration of Inspection, requirements for transfer operations, and information that must be contained in the Operations Manual. All marine terminals are required to submit updated Operations Manuals to CSLC for review and approval.

A requirement that each marine oil terminal operator must implement a marine oil terminal security program is contained in section 2430 of CCR Title 2, Division 3, Chapter 1, Article 5.1. At a minimum, each security program must:

- Provide for the safety and security of persons, property, and equipment on the terminal and along the dockside of vessels moored at the terminal;

- Prevent and deter the carrying of any weapon, incendiary, or explosive on or about any person inside the terminal, including within his or her personal articles;

- Prevent and deter the introduction of any weapon, incendiary, or explosive in stores or carried by persons onto the terminal or to the dockside of vessels moored at the terminal; and
- Prevent or deter unauthorized access to the terminal and to the dockside of vessels moored at the terminal.

The Marine Facilities Division has also issued regulations on the following:

- Inspection and Monitoring (Article 5, 2300);
- Marine Terminal Personnel Training and Certification, (article 5.3);
- Structural Requirements for Vapor Control Systems at Marine Terminals (article 5.4); and
- Marine Oil Terminal Pipelines (article 5.5).

The requirements in these sections include the following:

- Annual inspections and structural analysis once every 3 years (§ 2320);
- Notification of transfer operations to CSLC (§ 2325);
- Exchange of Information and Declarations of Inspection by Barge operator and Terminal operator (§ 2330 and § 2335);
- Specific transfer requirements, communications, terminal person in charge (TPIC) and equipment requirements (§ 2370, 2375, 2380);
- At all times, offshore terminals shall have the capability of drawing and maintaining a vacuum on all submarine pipelines containing oil and, at all times during mooring and unmooring operations at offshore terminals, a vacuum shall be maintained on all submarine pipelines containing oil. (§ 2390);
- For onshore terminals prior to the commencement of transfer of persistent oil, a boom shall be deployed to contain any oil that might be released. Marine terminals which are offshore or are subject to high velocity currents, where it may be difficult or ineffective to pre-deploy a boom, are required to provide sufficient

boom, trained personnel, and equipment so that at least 600 feet of boom can be deployed for containment within 30 minutes. (§ 2395);

- Employee training requirements, approval and inspections (§ 2500);
- Each component of a pipeline which is exposed to the atmosphere shall be coated with material suitable for protecting the component from atmospheric corrosion. (§ 2563;
- Pressure Testing requirements and scheduling (§ 2564);
- Leak detection systems for Class II pipelines shall be implemented including: (1) Instrumentation with the capability of detecting a transfer pipeline leak equal to two percent (2 percent) of the maximum design flow rate within five minutes; or (2) Completely containing the entire circumference of the pipeline provided that a leak can be detected within fifteen minutes; or (3) For transfer operations which do not involve the use of hoses, conducting a pressure test of the pipeline acceptable to the Division Chief immediately before any oil transfer (§ 2569); and
- Preventative maintenance program including pressure testing every 3 years and annual cathodic protection tests (for pipelines with cathodic protection), and annual testing of emergency shut-off valves and equipment (§ 2570).

California State Lands Commission - MOTEMS

The MOTEMS were approved by the California Building Standards Commission on January 19, 2005. These standards apply to all existing and new marine oil terminals in California, and include criteria for inspection, structural analysis and design, mooring and berthing, geotechnical considerations, fire, piping, mechanical and electrical systems. The purpose of MOTEMS is to establish minimum engineering, inspection and maintenance criteria for marine oil terminals in order to prevent oil spills and to protect public health, safety and the environment. MOTEMS does not, in general, address operational requirements. Relevant provisions from existing codes, industry standards, recommended practices, regulations and guidelines have been incorporated directly or through reference, as part of MOTEMS.

California Department of Fish and Game

The Office of Oil Spill Prevention and Response (OSPR) was created within the CDFG to adopt and implement regulations and guidelines for spill prevention, response planning, and response capability. Final regulations regarding oil spill contingency plans for vessels and marine facilities were issued in November 1993, and last updated in October 2002. These regulations are similar to, but more comprehensive than, the Federal regulations. The regulations require that tank vessels, barges, and marine facilities develop and submit their comprehensive oil spill response plans to OSPR for review and approval.

OSPR's regulations require that marine facilities and vessels be able to demonstrate that they have the necessary response capability on hand or under contract to respond to specified spill sizes, including a worst-case spill. The regulations also require that a risk and hazard analysis be conducted on each facility. This analysis must be conducted in accordance with procedures identified by the American Institute of Chemical Engineers (AIChE).

SB 2040 established financial responsibility requirements and required that Applications for Certificate of Financial Responsibility be submitted to OSPR. California's requirement for financial responsibility is in excess of the Federal requirements.

SB 2040 also requires the OSPR to develop a State Oil Spill Contingency Plan. In addition, each major harbor was directed to develop a Harbor Safety Plan addressing navigational safety, including tug escort for tankers.

California Coastal Commission (CCC)

The CCC has statutory authority relative to oil spills under the following two statutes: California Coastal Act of 1976 and Lempert-Keene-Seastrand Oil Spill Prevention and Response Act of 1990. The CCC responsibilities include all of California's coastal shoreline, including ports and harbors. Responsibilities include:

- Review of coastal development projects related to energy and oil infrastructure for compliance with the Coastal Act and consistency with the Coastal Zone Management Act;
- Review of regulations for oil spill prevention and response, and input on these regulations' consistency with Coastal Act regulations and policies;
- Review of oil spill contingency plans for marine facilities located in the coastal zone, and oil spill response plans for facilities located on the outer continental shelf;

- Participation in the State Interagency Oil Spill Committee (SIOSC), SIOSC Review Subcommittee, and Oil Spill Technical Advisory Committee meetings and assignments;
- Participation in studies that will improve oil spill prevention, response, and habitat restoration;
- Participation in oil spill drills; and
- Participation in the development of planning materials for oiled wildlife rehabilitation facilities.

Lempert-Keene-Seastrand Oil Spill Prevention and Response Act, (Oil Spill Prevention and Response Act [OSPRA], 8670 Gov. Code Chapter 7.4)

This Act requires preparation of a State oil spill contingency plan to protect marine waters. It also empowers a deputy director of the CDFG to take steps to prevent, remove, abate, respond, contain, and clean up oil spills. Notification is required to the Governor's Office of Emergency Services, which in turn notifies the response agencies, of all oil spills in the marine environment, regardless of size. Oil Spill Contingency Plans must be prepared and implemented. The Act creates the Oil Spill Prevention and Administration Fund and the Oil Spill Response Trust Fund. Pipeline operators pay fees into the first of these funds for pipelines transporting oil into the state across, under, or through marine waters. The Lempert-Keene Act also directs authority to the CSLC for oil spill prevention from and inspection of marine facilities (PRC 8750 *et seq*).

California Coastal Act of 1976 (Public Resources Code, Division 20)

The California Coastal Act of 1976 (Public Resources Code, Division 20) created the California Coastal Commission (CCC), with the responsibility of granting development permits for coastal projects and for determining consistency between Federal and State coastal management programs. Section 30232 of the Coastal Act addresses hazardous materials spills and states that "Protection against the spillage of crude oil, gas, petroleum products, or hazardous substances shall be provided in relation to any development or transportation of such materials. Effective containment and cleanup facilities and procedures shall be provided for accidental spills that do occur."

Also in 1976, the State Legislature created the California State Coastal Conservancy to take steps to preserve, enhance, and restore coastal resources and to address issues that regulation alone cannot resolve.

California Pipeline Safety Act of 1981

This Act gives regulatory jurisdiction to the CSFM for the safety of all intrastate hazardous liquid pipelines and all interstate pipelines used for the transportation of hazardous or highly volatile liquid substances. The law establishes the governing rules for interstate pipelines to be the Federal Hazardous Liquid Pipeline Safety Act and Federal pipeline safety regulations.

Overview of California Pipeline Safety Regulations

California Government Code sections 51010 through 51018 provide specific safety requirements that are more stringent than the Federal rules. These include:

- Periodic hydrostatic testing of pipelines, with specific accuracy requirements on leak rate determination;
- Hydrostatic testing by State-certified independent pipeline testing firms;
- Pipeline leak detection; and
- Requirement that all leaks be reported.

Recent amendments require that pipelines include leak prevention and cathodic protection, with acceptability to be determined by the CSFM. All new pipelines must be designed to accommodate the passage of instrumented inspection devices, i.e., smart pigs.

Oil Pipeline Environmental Responsibility Act (Assembly Bill [AB] 1868)

This Act requires every pipeline corporation qualifying as a public utility and transporting crude oil in a public utility oil pipeline system to be held strictly liable for any damages incurred by “any injured party which arise out of, or caused by, the discharge or leaking of crude oil or any fraction thereof ....” The law applies only to public utility pipelines for which construction would be completed after January 1, 1996, or that part of an existing utility pipeline that is being relocated after the above date and is more than three miles in length.

Area Contingency Plan

There are seven Area Committees along coastal California, and each Area Committee is responsible for oil spill response and preparedness planning within a specific geographic area. The LA/LB North Area Committee includes San Luis Obispo, Santa Barbara, and Ventura Counties. The Area Committees are each chaired by a U.S. Coast Guard representative and include oil spill response representatives from Federal, State, and local government agencies. The State Office of Oil Spill Prevention and Response (OSPR) is the lead non-Federal agency.

The LA/LB North Area Committee developed a site-specific oil spill response plan called the Area Contingency Plan. The plan provides clear directives on oil spill response, including the organization of incident command, planning and response roles and responsibilities, response strategies, and logistics. In addition, site-specific response plans are described for various coastal segments where there are species and other resources of concern. Each of the seven Area Contingency Plans is updated annually, so that the plans are current and accurate.

The plan provides site-specific information on resources of concern, local contacts, access to sites, and containment strategies.

Local

Santa Barbara County has local jurisdiction over the EMT area and the city of Goleta has jurisdiction over the EOF and the Line 96 pipeline.

Santa Barbara County

The Santa Barbara County Energy Division has established a number of programs and plans to address oil and gas operations in the County.

<u>System Safety and Reliability Review Committee (SSRRC)</u>

The Santa Barbara County Board of Supervisors originally established the SSRRC in 1986 to identify and require correction of possible design and operational hazards for oil and gas projects prior to construction and startup of the project and for project modifications. The SSRRC is delegated authority to review the technical design of facilities, as well as to review and approve the Safety, Inspection, Maintenance and Quality Assurance Program (SIMQAP) and its implementation (conduct safety audits, review facility changes, etc.).

<u>Safety Inspection, Maintenance and Quality Assurance Plan (SIMQAP)</u>

The purpose and scope of the SIMQAP is to identify procedures that will be used during the operation of a facility and to insure that all equipment will function as designed. The

SIMQAP identifies items to be inspected, maintained or tested, defines the procedure for such inspection, maintenance or testing, and establishes the frequency of inspection, maintenance or testing. SIMQAP audits are conducted on facilities to ensure compliance. The last SIMQAP was conducted on the EMT in 2004.

<u>Oil Transportation Plan</u>

The Oil Transportation Plan has determined that pipelines are preferable to marine tankering in terms of air quality, socioeconomics and risk of an oil spill.

<u>Safety Thresholds and Safety Element</u>

Santa Barbara County adopted Public Safety Thresholds in August, 1999. The thresholds provide three zones – green, amber, and red – for guiding the determination of significance or insignificance based on the estimated probability and consequence of an accident. In addition, a Safety Element Supplement was adopted in February 2000 (Board of Supervisors Resolution 00-56) covering hazardous materials (Santa Barbara County 2000). The objective of the Safety Element is to define unacceptable risk in a manner that guides consistent and sound land-use decisions involving hazardous facilities. As part of this objective, the County has defined unacceptable risk as involving new development as well as modifications to existing development if those modifications increase risk.

City of Goleta

The city of Goleta issues permits for development within its jurisdiction. The Line 96 SCADA system installation included modifications at the EOF and Line 96 which required the issuance of permits from the city of Goleta. Goleta is currently contracting with Santa Barbara County for technical support on these issues.

Other Applicable Guidelines, National Codes and Standards

Safety and Corrosion Prevention Requirements — ASME, National Association of Corrosion Engineers (NACE), ANSI, API

- ASME & ANSI B16.1 Cast Iron Pipe Flanges and Flanged Fittings;
- ASME & ANSI B16.9, Factory-Made Wrought Steel Butt Welding Fittings;
- ASME & ANSI B31.1a, Power Piping;

- ASME & ANSI B31.4a, addenda to ASME B31.4a-1989 Edition, Liquid Transportation Systems for Hydrocarbons, Liquid Petroleum Gas, Anhydrous Ammonia, and Alcohols;
- NACE Standard RP0190-95, Item No. 53071. Standard Recommended Practice External Protective Coatings for Joints, Fittings, and Valves on Metallic Underground or Submerged Pipelines and Piping Systems;
- NACE Standard RP0169-96, Item No. 53002. Standard Recommended Practice Control of External Corrosion on Underground or Submerged Metallic Piping Systems;
- API 570 Piping Inspection Code, applies to in-service metallic piping systems used for the transport of petroleum products;
- API 575 API Guidelines and Methods for Inspection of Existing Atmospheric and Low-pressure Storage Tanks;
- API 650 Welded Steel Tanks for Oil Storage;
- API 651 Cathodic Protection of Aboveground Storage Tanks;
- API 653 Tank Inspection, Repair, Alteration, and Reconstruction;
- API 2610, Design, Construction, Operation, Maintenance, and Inspection of Terminal & Tank Facilities; and
- API Spec 12B - Bolted Tanks for Storage of Production Liquids.

API Standard 653 is specifically addressed in the Venoco SPCC Plan. API 653 addresses the following issues:

- Tank suitability for service;
- Brittle fracture considerations;
- Inspections;
- Materials;
- Design considerations;

- Tank repair and alteration;
- Dismantling and reconstruction;
- Welding;
- Examination and testing;
- Marking and recordkeeping
- Pertinent issues related to tank inspections in API 653 are summarized below.
- External inspections by an authorized inspector every 5 years;
- Ultrasonic inspections of shell thickness every 5 years (when corrosion rate not known);
- Internal bottom inspection every 10 years, if corrosion rates not known; and
- Appendix C – detailed checklists for in-service and out-of-service inspections.

Fire and Explosion Prevention and Control, National Fire Protection Agency (NFPA) Standards

- NFPA 30 Flammable and Combustible Liquids Code and Handbook;
- NFPA 11 Foam Extinguishing Systems;
- NFPA 12 A&B Halogenated Extinguishing Agent Systems;
- NFPA 15 Water Spray Fixed Systems;
- NFPA 20 Centrifugal Fire Pumps; and
- NFPA 70 National Electrical Code.

Oil Spill Task Force

The Pacific States/British Columbia Oil Spill Task Force was authorized by a Memorandum of Cooperation signed in 1989 by the Governors of Alaska, Washington, Oregon, and California and the Premier of British Columbia following the Nestucca and Exxon Valdez oil spills. Hawaii was added in 2001. The Task Force Members are senior executives from the environmental agencies with oil spill regulatory authority. The group addresses oil spill prevention, preparedness and response, and liaisons with industry and other agencies. The current strategic plan places an emphasis on developing and refining a regional spills database, conducting risk-based analysis of spill causes, spill prevention, and best practices for marine operations.

4.2.3 Significance Criteria

A hazards and/or hazardous materials impact is considered significant if any of the following apply:

- There is a potential for fires, explosions, spills of flammable or toxic materials, or other accidents from the EMT or from barges at the loading facilities that could cause injury or death to members of the public;
- Operations would increase the probability or volume of oil spills into the environment;
- The existing facility does not conform to its oil spill contingency plans or other plans that are in effect, or if current or future operations may not be consistent with Federal, State or local regulations. Conformance with regulations does not necessarily mean that there are not significant impacts; or
- Existing and proposed emergency response capabilities are not adequate to effectively mitigate spills and other accident conditions.

The potential discharge of hazardous materials into the environment, such as crude oil spills, is quantified in this section; however, associated impacts to the environment are discussed in Sections 4.4, Hydrology, Water Resources, and Water Quality, and 4.5, Biological Resources.

4.2.4 Impact Analysis and Mitigation

Impacts and proposed mitigation measures are discussed below. Impacts are limited to direct, acute impacts to human health in the form of injuries and fatalities, and increases in oil spill risk in the form of increased spill volumes or probabilities.

Increase in Spill Probability

The proposed operations were evaluated at the permitted capacity of the EMT, or 13,000 barrels per day (BPD) (2,069 m^3). At this level, barge trips would increase to approximately 88 trips per year, or more than weekly, and therefore loading operations at the EMT would also increase by this amount. Since the storage at the EMT, the capacity of the loading line and equipment, and the loading pipeline transfer rates would remain the same, the size of spills would be the same for the proposed Project as for the current operations. However, the frequency of spills would increase due to an increase in barge trips and an increase in the annual operating hours of the loading pipeline.

Line 96 failure rates would remain the same as the current operations because the failure rate of a pipeline is not a function of the throughput or the operating pressures (CSFM 1993) and the pipeline is normally full of oil even when not transferring in batch mode. Spill volumes for Line 96 would be somewhat greater for the proposed case as the pipeline is operating more, but a rupture or leak from the pipeline would still spill a similar volume of oil as most of the oil from spills is generated by the volume of oil in the pipeline (about 1,700 bbls [270 m^3]), not the actual pumping rate (about 20 bbls/minute [3.2 m^3/minute]). (This is not the case on the loading line as the pumping rates are very high.)

Expected spill frequencies and probabilities are shown in Tables 4.2-11 and 4.2-12 for pipeline and barge operations, respectively, along with the current baseline operations.

Table 4.2-11
Permitted Operations Pipeline Systems Failure Rates and Probabilities

	Current Operations		Permitted Operations	
Pipeline and Scenario	**Failure Rate (events per year)**	**Lifetime Spill Probability (percent)** [7]	**Failure Rate (events per year)**	**Lifetime Spill Probability (percent)** [7]
Line 96 - Leak	3.5×10^{-2}	30	3.5×10^{-2}	30
Line 96 - Rupture	6.3×10^{-3}	6.2	6.3×10^{-3}	6.2
EMT loading line – Leak on Land	1.14×10^{-2}	11	1.11×10^{-2}	10
EMT loading line – Leak on Ocean	1.81×10^{-1}	84	1.94×10^{-1}	86
EMT loading line – Rupture on Land [8]	8.36×10^{-5}	0.1	2.44×10^{-4}	0.3
EMT loading line – Rupture on Ocean [8]	9.01×10^{-4}	0.9	2.63×10^{-3}	3.2
Pumps and pumping equipment	1.9×10^{-5}	<0.1	5.6×10^{-5}	0.1

[7] Based on a 10 year lifetime, probability for a single spill
[8] EMT line rupture rate is only while operating.

Table 4.2-12
Permitted Operations Barge Failure Rates and Probabilities

	Current Operations		Permitted Operations	
Scenario	**Failure Rate (events/ per year)**	**Lifetime Spill Probability (%)** [9]	**Failure Rate (events per year)**	**Lifetime Spill Probability (%)** [9]
Historical Analysis				
Spill size < 1 gallon frequency	2.5×10^{-2}	21.8	7.5×10^{-1}	60.9
Spill size > 1 gallon frequency	2.1×10^{-2}	18.9	6.4×10^{-1}	55.1
Spill size > 10 gallon frequency	1.4×10^{-2}	12.8	4.1×10^{-2}	40.7
Spill size > 100 gallon frequency	6.4×10^{-3}	6.2	1.9×10^{-2}	21.6
Spill size > 1000 gallon frequency	2.3×10^{-3}	2.2	6.9×10^{-2}	8.3
Spill size > 10,000 gallon frequency	9.5×10^{-5}	0.1	3.6×10^{-4}	0.36
Spill size > 100,000 gallon frequency	1.1×10^{-5}	0.01	4.3×10^{-5}	0.044
Fault Tree Analysis				
Large spill from barge at Coal Oil Point	9.9×10^{-3}	9.4	3.8×10^{-2}	31.5
Smaller spill from barge at Coal Oil Point	2.5×10^{-2}	22.31	9.6×10^{-2}	61.9
Spill from barge in transit to SF or LA	2.6×10^{-3}	2.6	1.1×10^{-2}	9.6

[9] Based on a 10 year lifetime.

Spill frequencies and probabilities for equipment at the EMT (crude oil tanks and piping) would remain the same as the current operations.

Impacts related to the significance criteria are discussed below.

Increases in Injuries or Fatalities

Injuries could be produced from the operations by exposing persons to vapors from spilled crude oil or from thermal radiation from crude oil fires. Both of these could occur from the EMT, along Line 96, or from the barge. The frequency of spills of crude from the EMT crude oil tanks and Line 96 would be the same as the current operations. However, the increased frequency of oil shipping would increase the risks associated with the EMT pumps and with the barge operations. Impacts from a crude fire or spill at the EMT or barge would have the same consequences as the current operations, but would increase in frequency due to the increase in the number of annual barge trips. Impacts from both the EMT pumping operations would impact recreational areas near the EMT or the barge. Impacts would not extend into residential areas.

Spill sizes would be the same from the EMT and the barge. Spill sizes would increase from Line 96 as throughput would increase in Line 96 for the proposed Project. However, a spill could occur from Line 96 at any time due to the fact that the pipeline always contains oil.

Impact HM-1: Acute Risks of Crude Spills

A spill of oil could result in acute impacts to the surrounding areas by exposing persons to crude fires and toxic vapors (Potentially Significant, Class II).

Impact Discussion

The increases in crude transportation would increase the frequency of crude oil spills from EMT loading operations. This would increase the acute risks to recreational areas on the Ellwood Mesa due to crude fires and toxic vapors associated with a crude oil spill. Spill sizes from Line 96 would also increase marginally, thereby increasing the size of hazard zones around Line 96.

The EMT storage tanks were installed nearly 80 years ago and, given the recent issues related to the tank integrity, a thorough program of inspection and maintenance should be established. A failure of the tanks could release crude oil into the diked areas and release toxic vapors or, given an ignition source, ignite and produce thermal effects due to a crude tank fire. Ineffective maintenance of the tanks would increase the frequency of a tank failure. The American Petroleum Institute has developed a number of standards and recommended practices related to atmospheric storage tanks, including API 575, API 650, API 651, API 653, API 2610 and API 12B.

The significance criteria indicate that any increase in acute risks is significant. Therefore, this impact is considered significant (Class II).

Mitigation Measures

HM-1a. Reduced Crude Oil Hydrogen Sulfide Content. The Applicant shall institute measures to reduce the crude oil hydrogen sulfide content before the crude oil leaves the EOF. These measures could include increased crude oil scrubbing or other measures to reduce the hydrogen sulfide levels in the crude oil.

HM-1b. EMT Tank Maintenance Program. The Applicant shall, within 6 months time, develop and submit to the CSLC and the County of Santa Barbara for review and approval, a tank maintenance program for the EMT crude oil tanks that addresses inspections, inspection frequency (both external and internal), maintenance of tank shell and appurtenances, non-destructive testing, cathodic protection, dike and drain maintenance, and seismic analysis and retrofits to ensure tanks conform to current building codes. API 653 full tank inspections should be conducted by a registered API 653 tank inspector at least every 5 years.

Rationale for Mitigation

The reduction of the H_2S content in the crude would directly impact the size of the area that could be impacted by a toxic vapor cloud. A reduction of crude H_2S levels would potentially eliminate the offsite impacts associated with toxic vapor clouds. This could be achieved at the EOF by increasing the stripping in the crude oil H_2S stripping vessel or increasing the number of stripping vessels in operation. This measure would reduce the acute risks from an oil spill to a level that would be less than current operations.

The EMT tanks have recently undergone significant repairs due to corrosion related issues on both tanks. These recent issues call into question the status of the tanks in terms of maintenance. Well maintained tanks leak less often and are more capable of maintaining integrity in the event of an earthquake. A maintenance program would detect corrosion issues, valve and piping integrity, dike maintenance and ensure seismic integrity. Poorly maintained equipment has a higher failure rate, which would increase the probability of impacts to the public given a spill. A comprehensive maintenance program for the tanks, including seismic analysis and retrofits, would ensure reliable operation for the lease period.

Increases in Oil Spill Risk

The increased loading operations and the number of barge trips would increase the frequency and probability of oil spills to the environment. The consequences of these spills would remain the same as the current operations. The risk of spills to the environment would be the same as current operations for the EMT crude oil tanks.

Impact HM-2: Risks of Crude Oil Spills to the Environment

A spill of oil could result in impacts to the surrounding areas by impacting environmental resources (Significant, Class I).

Impact Discussion

Impacts to the environment are discussed in detail in Sections 4.4, Hydrology, Water Resources, and Water Quality, and 4.5, Biological Resources. Increased loading operations would increase the hours per year that the loading pumps are operating and that the barge is located offshore and is loading. This increase in presence of the barge and increase in time that the loading pipeline and the loading pumps are operating would increase the frequency of spills to the environment over the current operations.

Mitigation measures (MM) listed in Sections 4.4, Hydrology, Water Resources and Water Quality, 4.5, Biological Resources, and 4.1, Geological Resources, and those MMs listed below for impacts related to oil spill compliance and response would reduce the frequency of oil spills. However, risk of spills to the environment would still increase over current operations. Therefore, potential impacts associated with crude oil spills to the environment would be significant (Class I).

Oil Spill Compliance

Compliance with the CSLC requirements for marine terminals has been examined by the CSLC audits conducted over the past 10 years. As volumes of spilled crude are not expected to increase, compliance issues with CSLC requirements are not expected to change. There are a few areas, however, where operations could more directly comply with CSLC requirements. These issues are discussed below and as mitigation measures.

Impact HM-3: Increased Spill Sizes Due to Loading Pipeline Vacuum/Evacuation Operation

A spill of oil could result in larger impacts if the loading line is not capable of operating in vacuum mode or being evacuated (Potentially Significant, Class II).

Impact Discussion

Section 2390, CSLC regulations, indicates that loading lines for offshore terminals shall be able to operate in a vacuum. This requirement would enable the loading line to draw the oil back into the EMT and to draw seawater into the pipeline, if a leak is discovered. This would reduce the size of a leak over the scenario where no vacuum is available. The regulations also state that, during mooring, a vacuum shall be maintained on the loading line. The EMT cannot currently operate the loading line in a vacuum. Currently, the facility has a waiver for the vacuum operation requirement. Also, in lieu of operating in a vacuum, the ability to pump seawater back through the loading pipeline to clear the loading pipeline of oil in the event of a spill would reduce the size of the spill. The barge is only capable of doing this when it is full, as the intake for the seawater pumps on the barge is above the water line when the barge is not sitting low in the water (barge is empty). The Emergency Action Plan (EAP) states to displace the loading pipeline with seawater in the event of a loading pipeline spill. However, this would not be possible if the barge is not full. This impact would be significant (Class II).

Mitigation Measures

HM-3a. **Loading Line Vacuum/Evacuation Operations**. The Applicant shall ensure that the loading line can be operated in a vacuum and that operation in a vacuum is established as part of the terminal operations manual and as part of the oil spill response. In lieu of vacuum operation, applicant could implement a method for evacuating the loading line in the event of a leak. Evacuation of the line should be possible at all times during loading (even when barge is empty).

Rationale for Mitigation

The ability to draw a vacuum on the loading line or to evacuate the loading line could substantially reduce the size of a release from the pipeline if a leak occurred. This would enable a negative pressure to be placed on the pipeline, drawing ocean water into the pipeline, or to pump out the oil in the loading pipeline and back to the EMT tanks as opposed to oil spilling into the marine environment. This would be accomplished by installing piping capable of running the pumps at the EMT in a mode that moves the oil from the pipeline back to the tanks or modifying the intake on the barge Jovalan to be below the water line when the barge is empty.

Oil Spill Response

Oil spill volumes associated with the proposed Project are not estimated to increase as the same equipment will be used for the proposed Project as for the current operations. Oil spill response equipment and capabilities appear to be in compliance with regulations for the current operations. However, there are a number of items that could increase the reliability of the current operations, i.e., decrease the frequency, and provide more effective response capabilities that are not specifically required by the regulations. These are included below.

Impact HM-4: Increased Spill Sizes Due to Loading Pipeline Leak Detection

A spill of oil could result in larger impacts if the leak goes undetected for a long period of time (Potentially Significant, Class II).

Impact Discussion

Section 2569, CSLC regulations, indicates that a terminal loading line should be equipped with a leak detection system if it is a Class II pipeline (has experienced recent leaks). This requirement can be fulfilled by pressure testing if the loading line is not equipped with a hose. The EMT loading line is equipped with a hose, but is also not a Class II pipeline. A leak detection system capable of detecting at least a 2 percent loss of flow balance would enable a leak to be detected during periods when the pipeline route is not visible, such as at night or during foggy periods or other periods of low visibility, and might enable a leak to be detected faster during normal operations. Faster detection of a leak would enable quicker mobilization of spill clean-up efforts, even during nighttime and foggy periods. This impact would be significant (Class II).

Mitigation Measure

HM-4a. **Loading Pipeline Leak Detection.** The Applicant shall ensure that both the shipping end and the receiving end of the loading pipeline are equipped with flow meters and that the flow meters utilize a means of conducting automatic and continuous flow balancing to an accuracy of at least 2 percent. Any deviations shall activate an alarm system at both the shipping and receiving locations. Barge loading should only occur during daylight hours when there is clear visibility to ensure smaller leaks are detectable.

Rationale for Mitigation

As the loading times for the barge extend into the nighttime, and Coal Oil Point is frequently foggy with reduced visibility, a means of detecting a leak that does not rely on visual inspection could substantially reduce the response time to a leak. This could reduce the size of a pipeline leak and its resulting impacts to coastal resources. A leak detection system would not detect smaller leaks, below the 2 percent value. Therefore, loading of the barge should only occur during daylight hours when there is clear visibility. This would enable detection of spilled oil on the water or soil surfaces.

Impact HM-5: Increased Spill Sizes Due to Failure to Deploy Loading Booms

A spill of oil could result in larger impacts if the leak is not captured by a boom in a short period of time or small spills may go unnoticed if a boom is not in place (Potentially Significant, Class II).

Impact Discussion

Section 2395, CSLC regulations, indicates that a boom is required to be in place during normal loading operations at onshore terminals. This is not a requirement for offshore terminals, such as the EMT or for onshore terminals where there are high velocity currents. However, the placement of a boom around the barge during normal loading operations would have multiple benefits: small amounts of oil spilled during loading would be immediately captured by the boom and the possibility of oil from oil seeps collecting along the barge would be reduced. As there are numerous seeps in the area, a boom would enable the oil on the water from seeps to be separated from oil that may have been released from the barge operations. This impact would be significant (Class II).

Mitigation Measures

HM-5a. Loading Booms. The Applicant shall pre-boom all oil transfers using booms that are effective for the ocean conditions at the EMT location. For loading operations, the boom shall enclose the water surface surrounding the vessel to provide containment for the entire vessel at the waterline. The boom shall be deployed so that it provides a stand-off of not less than 4 feet (1.2 m) from the outboard side of the vessel.

Rationale for Mitigation

Although pre-booming is not a regulatory requirement, the location of seeps in the area introduces the possibility that oil could gather along and around the barge during loading operations and leave larger tar balls on the beach after the barge leaves the mooring. Booming the area during loading would address this potential as tar balls would be collected by the boom. In addition, the presence of a boom during loading would reduce the consequences of a spill as a boom would already be in place if a spill occurred. Booms are specifically designed for the offshore and deep water environment and are able to remain effective at wave heights to 15 feet (4.5 m) (Slickbar 2005).

Impact HM-6: Spills Due to Loading Pipeline Failure from Inadequate Loading Pipeline Inspections

A failure to inspect the loading pipeline for corrosion or unsupported spans could result in a release of crude oil and an impact to the environment (Potentially Significant, Class II).

Impact Discussion

As the loading pipeline has been in service for an extended period of time, there is the possibility of corrosion of the pipeline which could lead to a release of crude oil. Tests conducted by the applicant using Long Range Guided Ultrasonic Screening (GUL) were conducted in 2001, 2002 and 2004 and showed acceptable corrosion levels. However, these tests were only conducted on the loading line between the water and the loading line pumps. Uncertainty remains as to the quality of the pipeline that is offshore. CSLC indicates, through API 570 and CSLC publications related to API 570 (CSLC 2005) that pipe thickness measurements and corrosion rate estimates are to be performed for all sections of piping. Technologies such as retractable/bi-directional pigs are commercially available that could be inserted into the pipeline at either the hose location or near the pump-house location to inspect the entire pipeline, thereby helping to ensure the pipeline integrity (Nye 2000; A'Hak 2005).

Visual inspection of the pipeline ensures that there are no unsupported spans, either on the beach or underwater along the pipeline route between the beach and the loading hose. Unsupported spans can increase the stresses in a pipeline, thereby increasing the frequency of pipeline failure. Remotely operated vehicle (ROV) or diver inspections of the underwater portion of the pipeline should be conducted periodically. ROV inspection of Platform Holly and seep tent pipelines were conducted in 2003.

See **MM GEO-3a**, which addresses pipeline inspections after storm events.

This impact would be significant (Class II).

Mitigation Measures

HM-6a. Loading Pipeline Inspections. The Applicant shall investigate and utilize a non-destructive testing procedure, which will enable inspection of the loading pipeline from the pump-house to the hose connection for both corrosion, internal and external, and for allowable pipe stresses due to settling. Visual inspection of the entire pipeline route for unsupported spans or other pipeline route anomalies should also be conducted at least every 3 years.

Rationale for Mitigation

Although pressure testing of a pipeline gives some assurance of pipeline integrity, a number of pipeline spills have occurred due to anomalies that were not detected by pressure tests. The Platform Irene release of 1997 is a good example, where the failure of the pipe occurred at a flange weld approximately midway between Platform Irene and the shoreline. A crack developed in the weld connecting a flange to the pipe. The metal in this area was determined to be brittle due to the weld construction techniques where the metals were not properly pre-heated, thereby increasing the metal brittleness. Subsequent cracking occurred in this area possibly due to external strains, believed to be caused in part by the 50-foot (15.2-meter) unsupported span of pipeline at the leak location. Smart-pig runs had been conducted in 1995 and 1996 with a lower resolution system than is currently being used.

Inspections of the offshore portions of the pipeline would help to ensure that corrosion is not an issue just as GUL inspections ensured that corrosion does not develop in the onshore portions of the pipeline.

Visual inspection of the pipeline corridor would help to ensure that unsupported spans do not compromise the integrity of the pipeline.

Impact HM-7: Spills Due to Pump Leaks and Lack of EMT Pump Drains Spill Containment

A spill of crude oil at the EMT pumps could impact the sensitive slough areas through unprotected drains (Potentially Significant, Class II).

Impact Discussion

A spill of crude oil at the EMT pumps during pumping would drain directly into unprotected drains which empty into the Devereux Slough area. For impacts to the slough area, please see Sections 4.4, Hydrology, Water Resources, and Water Quality, and 4.5, Biological Resources. See Figure 4.2-4 for pictures of the EMT drains under consideration. The EMT pump drain is located in front of the pump building. The EMT end drain is located on the far south-eastern end of the EMT. This impact would be significant (Class II).

Figure 4.2-4
Onshore EMT Facilities Drains

EMT Pump Drain   EMT End Drain

Mitigation Measures

HM-7a. EMT Spill Protection. The Applicant shall install drain protection in the form of sealable coverings, valves, or other method to prevent flow of spilled oil through the drains, on the EMT drains located at the far southern end of the EMT, immediately near the pumps and on the far side of the control shack. The drain protection would prevent a spill of crude oil that occurs at the loading pumps and/or at other EMT equipment from entering the drains and affecting the slough. Berms located at this end of the EMT should also be checked to ensure they can contain a worst case discharge from the pumps.

Rationale for Mitigation

Containment of spills is an important part of spill response. A spill at the pump area could enter into the slough through the drains or over the small berms. The drains should be protected with coverings and the berms should be evaluated to ensure that they can contain a large spill. This would reduce the impacts associated with a spill at the pumps by preventing the oil from reaching sensitive habitats.

Impact HM-8: Increased Spill Size Due to Spill Response Planning and Drills

A spill of crude oil at the Barge could impact additional sensitive areas if response is not adequate (Potentially Significant, Class II).

Impact Discussion

Venoco maintains an Oil Spill Contingency Plan (OSCP) for the South Ellwood Field that covers the EOF, EMT, Line 96, Ellwood Pier, Platform Holly, and Beachfront Lease PRC 421. The OSCP (Venoco 2005b) details the inspection and maintenance procedures as well as training and drills for the covered facilities, in addition to the spill response capabilities.

Due to the close proximity of the loading area to sensitive habitats, a spill from the barge or loading line would most likely impact sensitive habitats. However, effective response to a spill of crude oil from the barge or loading line could reduce the size of the area impacted by a spill, thereby reducing the impacts on marine and biological resources (see Sections 4.4, Hydrology, Water Resources, and Water Quality, and 4.5, Biological Resources). The USCG indicates that equipment deployment exercises and emergency procedure exercises be conducted periodically (CFR Title 33, section 154.1055). The USCG National Preparedness for Response Exercise Program (PREP) also directs companies to conduct regular exercises with the equipment.

The Venoco EMT EAP should include information detailing drills. This impact would be significant (Class II).

Mitigation Measures

HM-8a. Response Drills and Planning. The Applicant shall conduct periodic equipment deployment and on-water drills utilizing the response vessel (the Penguin) as well as other vessels that would respond to a drill. Drills should have a post-drill lessons-learned evaluation which is incorporated into the training and EAP documentation. Procedures for conducting drills should be detailed on the EAP.

Rationale for Mitigation

Training and conducting on-water drills with response equipment would enable responders to fine-tune response capabilities and would ensure adequacy in responding to a real-life spill event. Currently, drills are only conducted for responding to spills from Platform Holly. The drills should be expanded to include responding to a spill from the barge or the loading pipeline. Planning through the OSCP, particularly details on the spill response, boom deployment, prevention measures, and inspection and maintenance programs, would reduce the frequency and extent of impacts of spills.

Boom deployment related to **MM HM-5a** is related to normal operations, while this mitigation measure is related to emergency preparedness.

Impact HM-9: Spills Due to Barge Hull Penetrations

A spill of crude oil from the barge could be due to accidental grounding, collision, allision, or puncturing of the barge bottom which is exacerbated by the use of single-hulled vessels (Potentially Significant, Class II).

Impact Discussion

Current regulations require the replacement/conversion of the barge Jovalan with/to a double hulled barge by 2015. As the barge Jovalan is less than 5,000 gross tons (4,536 metric tons), it must comply by 2015 instead of the 2010 requirement associated with larger vessels. Double-hulled vessels have a lower frequency of spills due to the added protection that the double hull provides given a grounding, collision, allision, or bottom puncture. Requiring that the barge Jovalan convert to a double hulled vessel before the 2015 date would reduce the risk of an oil spill due to these causes. This would be considered a significant impact (Class II).

Mitigation Measures

HM-9a. Double Hull Barges in Near Term. The Applicant shall replace or convert the barge Jovalan with a double-hulled barge by the 2010 timeframe established by CFR Title 33 as the phase-in date for larger vessels to be double-hulled vessels.

In addition, implement **MM BIO-1b** (Oil Spill Contingency Plan updates) identified in Section 4.5, Biological Resources.

Rationale for Mitigation

Historically, many major spills from barges are related to groundings, collisions, or allisions that may have been reduced by the presence of double hulled vessels. The DOT estimates that double hulled vessels have a conditional probability of spills given a barge incident of 5 times less than that of single hulled vessels. Many of the barge release scenarios would benefit from double hulls, including collisions with other vessels or with the tug, allisions with mooring buoys, loss of control and subsequent grounding, bottom punctures, etc. Conversion of the barge to a double hulled vessel on a timeframe equal to that of larger vessels, by 2010, would reduce the probability of a spill given a barge incident.

Table 4.2-13
Summary of Hazards and Hazardous Materials Impacts and Mitigation Measures

Impact (Impact Class)	Mitigation Measures
Impact HM-1: Acute Risks of an Oil Spill (Class II)	**HM-1a.** Reduced Crude Oil Hydrogen Sulfide Content. **HM-1b.** EMT Tank Maintenance Program.
Impact HM-2: Risks of Crude Spills to the Environment (Class I)	None
Impact HM-3: Increased spill sizes due to Loading Pipeline Vacuum/Evacuation Operation (Class II)	**HM-3a.** Loading Line Vacuum/ Evacuation Operation.
Impact HM-4: Increased spill sizes due to Loading Pipeline Leak Detection (Class II)	**HM-4a.** Loading Pipeline Leak Detection.
Impact HM-5: Increased spill sizes due to failure to deploy Loading Booms (Class II)	**HM-5a.** Loading Booms.
Impact HM-6: Spills due to loading pipeline failure from inadequate loading pipeline inspections (Class II)	**HM-6a.** Loading Pipeline Inspections.
Impact HM-7: Spills due to Pump Leaks and lack of EMT Pump Drains Spill Containment (Class II)	**HM-7a.** EMT Spill Protection.
Impact HM-8: Increased spill size due to Spill Response Planning and Drills (Class II)	**HM-8a.** Response Drills and Planning. .
Impact HM-9: Spills due to Barge Hull Penetrations (Class II)	**HM-9a.** Double Hull Barge in near term.

4.2.5 Impacts of Alternatives

Alternatives are discussed in detail in Section 3.0, Alternatives. Impacts associated with each of the alternatives are addressed below.

No Project Alternative

Under the No Project Alternative, the risks associated with oil spills into the environment and the risks associated with toxic vapor releases and thermal radiation from fire would exist as with existing operations until the EMT facilities are shut down. Increased risks associated with other crude oil transportation methods would most likely exist.

Truck Transportation

If this method of crude oil transportation is selected under the No Project Alternative, the risks associated with oil spills into the environment from the EMT or Line 96 and the risks associated with toxic vapor releases and thermal radiation from fire at the EMT or Line 96 would cease to exist. However, increased risks would be introduced with loading and unloading crude oil at the EOF and Carpinteria, transportation of crude oil on the highways and pipeline transportation of crude oil south from Carpinteria.

Risks from Loading/Unloading Operations

Risks from loading and unloading operations at the EOF and at Carpinteria would be minimal. Loading/unloading operations would take place within diked and protected areas, so that impacts to the environment of a spill would be minimal. Impacts associated with spills and subsequent fires or toxic vapor clouds would most likely be limited to the onsite impacts, where much larger inventories of crude oil than truck tankers currently exist.

Risks from Truck Transportation

Risks from truck transportation are due to two elements: risks related to the hazardous material cargo, and risks related to accident trauma with subsequent injuries and fatalities.

Hazardous Materials Risks from Truck Transportation

Risks associated with the cargo would be a result of spills affecting the environment and/or spills with subsequent fires or toxic clouds impacting nearby motorists or nearby communities. These risks are defined by assessing the accident rate and the conditional probability of a spill and subsequent fire in combination with the population density of the communities through which the trucks would travel.

Numerous studies related to transportation risk have been conducted, including those prepared by the National Highway Transportation Safety Board (NHTSB), the U.S. Department of Transportation (DOT), the California Highway Patrol (CHP), studies published in the Journal of Loss Prevention and the Journal of Transportation Engineering, as well as European studies published in the Journal of Hazardous Materials.

The Federal Motor Carrier Safety Administration (FMCSA), part of the DOT, operates and maintains the Motor Carrier Management Information System (MCMIS). MCMIS contains information on the safety fitness of commercial motor carriers and hazardous material shippers subject to the FMCSA Regulations and the 49 CFR Hazardous Materials Regulations. As part of these requirements, reportable accident rates are generated for various types of carriers, including carriers of hazardous materials. More than 500,000 motor carriers are included in the database, of which approximately 40,000 carry hazardous materials. A DOT reportable accident is an accident that produces either a fatality, a hospitalization, or requires the vehicle be towed.

According to an FMCSA detailed analysis (FMCSA 2001), the non-hazmat accident rate was estimated to be 0.73 accidents per million vehicle miles and the average hazmat accident rate was estimated to be 0.32 accidents per million vehicle miles (0.20 per million km). This comparison is based on estimated mileage figures from the 1997 Commodity Flow Survey (CFS) and the HMIS database for the years 1995-1997.

Accident rates for class 3 materials, which include flammable and combustible liquids, which would be transported in non-pressurized, “thin” shell tankers, had a combined accident rate of 0.5 accidents per million miles (0.3 accidents per million km).

Caltrans maintains a database system of all traffic collisions that occur on the California Highway system. Title 23 Code of Federal Regulations (CFR) 1204.4, and California Vehicle Code (CVC) section 2900 requires the State of California to have a data collection system as part of the process to reduce the number and/or severity of collisions on roads. In response to Title 23, the State developed the Traffic Collision Reports (TCRs) used by police agencies to collect and compile collision data. When the State developed the TCRs, they also developed the collision database SWITRS that resulted from the data collected and compiled from the traffic collisions reports maintained by the CHP. The State also developed the Traffic Accident Surveillance and Analysis System (TASAS) used by Caltrans to analyze collision, traffic, and highway data collected and compiled by the CHP and Caltrans.

State highway related collision reports receive coding for a range of accident details. Caltrans then receives this State highway related data on a weekly basis for the TASAS system.

Collisions in the TASAS system include information on the following areas:

- Type of involved party for collisions and victims;
- Collisions by day and hour of day;

- Primary collision factors for collisions and victims;
- Motorcycle, bicycle, and pedestrian collisions and victims by time of day;
- Alcohol involvement by age and sobriety of involved party and by collision type;
- Pedestrian involved collisions, location details, and victim data;
- Bicyclist involved collisions, location details, and victim data; and
- Collision location details and involved party data year to date.

In addition to collision information, Caltrans compiles information on vehicle traffic volume levels for all vehicles, including trucks. Information is published annually.

A study conducted by Marine Research Specialists (MRS) for the County (Santa Barbara County 2004) obtained data from Caltrans on major highways in Southern California and in the central San Joaquin Valley (Highways 101, 5, 405, 166) from the TASAS system. The study examined collisions for a 10-year period from 1991 until 2001, and collected data on 13,300 collisions associated with over 18.6 billion truck miles (30 billion km). Accident rates for all trucks along all routes examined was estimated to be 0.72 accidents per million miles (0.45 per million km).

The MRS report also estimated reduction in accident frequency due to mitigation measures, such as training and driver hiring practices.

A summary of accident rates is shown in Table 4.2-14 below.

Given that an accident has occurred, the probability that a release also occurs is called the conditional probability. Conditional probabilities give the percentage (or fraction) of the time a spill, fire, or explosion might occur given that an accident has happened. A number of different studies define a range of conditional spill probabilities.

Table 4.2-14
Summary of Truck Accident Rates

Source	Accident Rate, per million miles
FCMSA, all trucks, 1995-1997	0.72
FCMSA, hazmat trucks only, 1995-1997	0.32
FCMSA, non-pressurized liquid only, 1995-97	0.50
DOE, bulk liquids, MC306 trucks	2.50
Corsi, tanker trucks, (Corsi 2000)	0.94
MRS, TASAS, all trucks, So. Calif., 1991-2001	0.72

Harwood (1993) addresses probabilities of hazardous material releases by highway type and urban/rural designation for trucks carrying hazardous materials. These range from a 9 percent probability of a release on a rural freeway to 6.2 percent on an urban freeway. Harwood also breaks down conditional probabilities by the type of accident. For example, collisions with a fixed object or non-motorist give a conditional spill probability of 1.5 percent, collision with another motorist is 3.6 percent, collision with another truck is 9.4 percent, running off the road is 33 percent and collision with a train is 45 percent.

The FMCSA study (2001) estimated that the conditional probability of a release of flammable liquids was 35 percent.

The Bureau of Transportation Statistics Trucks Involved in Fatal Accidents Database (TIFA) indicates that between 1996 and 1999, nationwide, there was a probability of 15 percent that a cargo tank truck involved in a serious (fatality related) accident would have a cargo spillage.

The DOT sponsored analysis (USDOT 2000) estimated the probability of release for MC306, bulk liquid tank trucks, at 6.5 percent.

Information was also obtained from the CHP Statewide Integrated Traffic Record System (SWITRS) database on tanker truck collisions between 1991 and 2001 on California highways. There were a total of 9,332 tanker truck collisions with about 2.6 percent involving spills of materials from tanker trucks.

A summary of conditional probabilities of a spill are given in Table 4.2-15.

Table 4.2-15
Conditional Probabilities of a Spill for Tank Trucks

Source	Spill Probability, percent
Harwood, all trucks, 1993	9 rural, 6.2 urban
FCMSA, non-pressurized liquid only, 1995-97	35
DOE, MC306 trucks	6.5
SWITRS, all tank trucks, 1991-2001	2.6

The large probability range shown above could be due to the reporting of events. For example, the CHP data would compile information on almost all accidents on the roadways, whereas the Federal data would be more inclined towards gathering only the significant accidents, thereby creating a higher conditional probability of a spill. The reporting quality and definition of an accident has a strong impact on the resulting data for accident rates and probabilities.

Accident Trauma Risks from Truck Transportation

In addition, placing additional trucks on the roadway would increase the rate of accidents that result in trauma related injuries or fatalities. These are injuries and fatalities that would occur only due to the truck accident, not due to the cargo that the truck was carrying.

The Agency for Toxic Substances and Disease Registry (ATSDR) initiated a program in 1990 to track hazardous material releases and their impacts. These releases are tracked for both transportation and fixed facility related releases and include information on the type of injury produced in the accident.

The purpose of ATSDRs Hazardous Substances Emergency Events Surveillance (HSEES) system is to describe the public health consequences associated with the release of hazardous substances and develop strategies to reduce and prevent releases and their associated adverse health effects. Thirteen states participated in HSEES for the most recent period of analysis (1998–2001): Alabama, Colorado, Iowa, Minnesota, Mississippi, Missouri, New York, North Carolina, Oregon, Rhode Island, Texas, Washington, and Wisconsin.

A detailed analysis of the HSEES database, obtained as part of this study, between the years 1996-2001, indicates that there are a total of 7,726 ground transportation events. Of these events, about 90 percent lead to no injuries or fatalities. Of the total events, about 4.7 percent cause injuries due to a release of material and about 4.5 percent cause injuries due to the accident itself, or trauma related injuries. For fatalities, about 1 percent of total events cause fatalities due to the trauma of the accident and about 0.08 percent cause fatalities due to the release of materials.

The SWITRS data was examined to determine the percentage of accidents involving tanker trucks that produced injuries and fatalities. Out of the 9,332 accidents recorded over the 10 years from 1992-2002, SWITRS indicates that 28 percent of the accidents produced injuries and that 1.8 percent of the accidents produced fatalities.

The SWITRS data was also examined to estimate the numbers of trauma related injuries or fatalities that could be produced in a single accident. Only accidents where hazardous materials were not released were examined. Table 4.2-16 summarizes the results of this analysis.

Table 4.2-16
Number of Victims in Large Truck Accidents

Number of Victims	Injury percent	Fatality percent
Single victim	68	88
Two victims	20	9.2
Three or more victims	12	2.7

Source: CHP SWITRS 1990-2003, hazmat incidents excluded

Conducting a risk analysis on these numbers indicates that the risks associated with injuries are partially driven by the hazardous materials releases and partially by accident trauma. A release of crude oil could produce a toxic injury zone that would probably injure more people than a trauma accident. However, the frequency of this occurring is lower than an accident producing trauma injuries. Accidents producing one or more injuries are expected to occur on the order of once every 12 years. This rate is dominated by the accident trauma rate.

As a spill of crude would not produce fatalities, accident fatalities caused by trauma are the primary source of fatalities associated with truck transportation. Accidents producing a single fatality are expected to occur on the order of once every 190 years.

These rates contemplate the proposed Project operating at its permit level of operation.

Risks from Truck Related Pipeline Transportation

In addition, transporting the crude oil to Carpinteria would require transporting the crude oil by pipeline from Carpinteria towards Los Angeles. This would be accomplished using the existing pipeline system. Because an existing pipeline system is being used, the frequency of a release would not be increased. However, as increased throughput of crude oil would occur on this existing pipeline system, spills would be marginally larger along this route. As the existing pipeline route travels along the Southern California coast, releases from this pipeline could impact the marine environment by traveling along gullies and drainages to the ocean. Spills could also impact residential areas along the route, such as La Conchita.

Impacts would be related to the increase in injury and fatality rates associated with the use of trucks along area highways. These impacts would also be offset by a decrease in the frequency and probability of spills to the environment caused by the current and proposed Project barge and offshore pipeline operations.

Impact HM-10: Trucks on Area Highways Impacts to Public Health

The use of trucks along area highways would increase the risk of fatalities and injuries to members of the public due primarily to the increase in truck accidents producing trauma (Potentially Significant, Class I).

Impact Discussion

The increase in truck trips along area highways would increase the rates of injuries and fatalities over those from current operations and those from the proposed Project. The proposed Project presents a relatively low risk of injuries or fatalities, and only in the immediate vicinity of the EMT and the barge loading area. These occur at a low frequency due to the low population densities. However, the trucking alternative moves a significant number of trucks along a busy highway through the middle of a densely populated area. Most of the additional injuries and all of the additional fatalities are due to traffic accidents producing trauma related injuries or fatalities. Due to the increased potential for injuries or death to the public, this impact would be significant (Class I).

Mitigation Measures

HM-10a. Trucks on Area Highways. The Applicant shall implement a driver program which ensures safe operation of truck carriers. This would include a review system for contracted truck carriers which would ensure that only those with the safest records can carry loads. The review system would include a review of CHP Mister reports, ensuring correct Class licensing, enrollment in a controlled substance and alcohol abuse program, completion of Motor Carrier Safety Review type safety questionnaire, and assessment of Bureau of Motor Carrier Safety Ratings. Applicant shall also ensure that trucking companies have programs in place to ensure that drivers maintain appropriate speeds. This would include: a 55-mph or applicable speed limit policy, training on speeding and speed limits along the proposed route, and/or speed control systems or governors in place on trucks. The Applicant shall also ensure that contracts address safety reviews, speeding and violations, and unacceptable incentive practices, such as increased pay for increased numbers of loads that may be an incentive for drivers to act in an unsafe manner.

Rationale for Mitigation

By ensuring that drivers act responsibly and are thoroughly trained and reviewed prior to contracting, the accident rates can be reduced substantially.

Residual Impact

This impact would remain significant (Class I).

Impact HM-11: Trucks on Area Highways Impacts to The Environment

The use of trucks to transport crude oil would produce lower risks to the environment than current operations (Beneficial, Class IV).

Impact Discussion

Risks of oil spills impacting the environment, particularly the marine environment, from oil transportation by trucks along area highways and by pipeline south of Carpinteria would be lower than the current operations at the marine terminal. Risks of impact to the environment would remain, however, as a release from the trucks or the Carpinteria pipeline could drain into gullies and drainage areas and reach the marine environment. However, impacts from these sources to the marine environment would require a large spill in order to reach the ocean, and impacts would most likely be smaller than a spill that occurs directly into the marine environment, such as from the EMT loading pipeline or barge. This reduction in impact in comparison to the potential impact of the proposed Project would be beneficial, Class IV.

Pipeline Transportation

If this method of crude oil transportation is selected under the No Project Alternative, the risks associated with oil spills into the environment from the EMT or Line 96 and the risks associated with toxic vapor releases and a thermal radiation from fire at the EMT or Line 96 would cease to exist. However, there would be some risks associated with transportation of crude oil by pipeline to the APPL system.

Impact HM-12: Pipeline Impacts to Public Health

The use of a pipeline to transport crude oil to the APPL system would produce lower risks to public health than current operations (Beneficial, Class IV).

Impact Discussion

The operation of only a pipeline, as opposed to pipelines and a marine terminal, reduces the risks to public health as well as the environment (as discussed above). Although the current operations of Line 96, the EMT, and the barge are considered acceptable by the Santa Barbara County Safety Element, they are classified as significant due to the “potential” for fatalities or injuries to the public. The pipeline alternative would reduce these risks over the current operations because the pipeline route would not pass through the community of Ellwood, as Line 96 currently does, and the EMT and barge operations would be eliminated. This impact would be beneficial (Class IV).

Impact HM-13: Pipeline Impacts to Environment

The use of a pipeline to transport crude oil to the APPL system would produce lower risks to the environment than current operations (Beneficial, Class IV).

Impact Discussion

Risks from oil transportation by pipeline are the lowest of any form of transportation. As the pipeline would be a new pipeline with pigging capabilities, it would have a substantially lower failure rate than either the Line 96 pipeline or the existing EMT loading line. A risk of impact to the environment would remain, however, as a release from the pipeline alternative could drain into gullies and drainage area and reach the marine environment. However, impacts to the marine environment would require a large spill in order to reach the ocean, and impacts would most likely be smaller and less frequent than a release that occurs directly into the marine environment, such as from the loading line. This impact would be beneficial, Class IV.

4.2.6 Cumulative Projects Impact Analysis

Cumulative projects that could exacerbate the impacts of the proposed Project include any projects that could increase the risks of acute human health impacts from the proposed Project, due to increased population density or proximity to the proposed Project, or any projects that could increase the risks of oil spills impacting the same areas of coastline as the proposed Project.

Two of the cumulative Projects listed in Section 4.0 would produce acute human health impacts on the same populations that are exposed to the proposed Project. These include the return to production of state lease PRC-421 (Project No. 7, See Section 4.0, Environmental Analysis, Table 4-1) and the extended field development (Project No. 8).

Production from lease PRC-421 would increase the amount of oil being transported by Line 96, and subsequently the EMT. This would marginally increase the size of oil spills from the facilities. In addition, as new pipelines would be installed/used between the PRC-421 location and the EMT, this would increase the frequency of spills to the environment, which would increase the risks of acute human health impacts. However, it is anticipated that PRC-421, in combination with the proposed Project, would present an acute human health risk that is acceptable as per the Santa Barbara County Safety Element.

The extended field development would involve abandoning the operations of the EMT and transporting oil by pipeline only. This would reduce the risks of acute human health impacts as the Line 96 and the EMT would no longer be used. There would be an associated increase in acute risks with the new facility's crude oil transportation. However, these acute risks are anticipated to be equal to or less than the acute risks of the proposed Project.

Projects which could produce an increased risk of oil spill that could impact the same coastal areas as the proposed Project include the following:

- Cabrillo Port/BHP Billiton LNG International, Inc. (Project No. 1);
- LNG Terminal at Platform Grace/Crystal Energy LLC (Project No. 2);

- Carpinteria Field Redevelopment Project/Carone Petroleum Corp. and Pacific Operators Offshore Inc. (Project No. 3);
- Paredon Project/Venoco (Project No. 4);
- Return to production of State Lease PRC-421/ Venoco (Project No. 7);
- Extended Ellwood Field Development, Venoco (Project No. 8);
- Platform Grace Mariculture/Hubbs-SeaWorld Research Institute (Project No. 9);
- Platform Grace Oil Drilling (Project No. 10).

Although the LNG Projects (Projects No. 1 and No. 2) do not involve oil transportation, the use of large tankers and support vessels introduces the risk of fuel spills into the marine environment because they have dual-fuel engines that use the boil-off LNG and oil fuel. The Carpinteria Field Redevelopment, Paredon, and PRC-421 Projects would involve increased offshore/nearshore drilling and associated crude oil transportation, which would increase the risks of oil spills into the environment. The Platform Grace Project would not involve movements of crude oil, but would increase vessel traffic and the risks of smaller spills of fuel from accidents. All of these Projects would exacerbate an already significant impact associated with the EMT proposed operations' risks of spills to the environment.

The Ellwood Field Development Project would involve increased spill risks due to offshore drilling. However, as the EMT would be abandoned as part of this Project, cumulative spill risks would most likely be reduced as part of this Project.

Residential Projects in the area would have no direct impact on the proposed Project risks. However, some of the cumulative Projects are residential developments in the near vicinity of the EMT and Line 96 pipeline. These would increase the populations that could be exposed to a crude oil spill and subsequent fire or toxic vapors. Exposure would be both along the Line 96 route and in the recreational vicinity of the EMT and loading pipeline. Recreation would be expected to increase with the increase in populations living nearby. These would all serve to increase the acute risks of operating the EMT and associated facilities.